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THE BRIGHT CHILD AND THE SCHOOL

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Few problems more perplexing present themselves in school administration or pedagogical procedure than that of grading pupils. How are we to separate them into groups capable of working together for a year with the maximum of individual and collective efficiency? One needs but to glance at the class list of any school grade to be impressed with the great disparity of age. Even in carefully graded schools where considerable effort is made to eliminate the "exceptional," one may find a three or four year range. Curiously enough the youngest pupil is often found to be doing the best work, the child of nine attaining more satisfactory results than his eleven year old classmates, the little ten year old more than holding his own among twelve and thirteen year old youngsters.

Naturally a large number of instances can be explained by fixed grading systems. The child who for any reason, such as ill health, change of residence, or the like, entered school late would have to spend a year in each grade and so could not make up lost time. Yet above all this we see clearly the difference in mental development not commensurate with bodily age.

A few years ago when we became interested in mental tests we felt that they would greatly help us in attaining justice in grading. Since it seemed obvious that children of one grade should have approximately the same mental age, we could test them and classify them upon that basis,

irrespective of physical age and with far less regard than formerly to facts learned. The child of given mental age would be able to do the work of that age, rapidly absorbing any facts of technique which had not chanced to fall in his way in the past. If it were discovered that in a given class there was great disparity of mental age, this fact would reflect some sort of discredit upon the school grading, show very little adaptation to needs of individuals, etc.

The following figures are summarized after giving intelligence tests to six classes in a large private school where the ratio of the number of teachers to the number of pupils was large, the grading reasonably flexible, and a good deal of individual work provided. In testing the first three grades the Goddard, 1911, revision of the Binet-Simon tests was used. With the last three classes the Stanford revision.

Grade IV.		Grade V.		Grade VI.	
Chron. Age. Children	Ment. Age Children	Chron. Age Children	Ment. Age Children	Chron. Children	Ment. Age Children
3...8 yrs.	5...9 yrs.	11..10 yrs.	3..10 yrs.	1...9 yrs.	9..11 yrs.
9...9 yrs.	9..10 yrs.	3..11 yrs.	7..11 yrs.	5..10 yrs.	7..12 yrs.
7..10 yrs.	7..11 yrs.	1..12 yrs.	5..12 yrs.	8..11 yrs.	3..13 yrs.
3..11 yrs.	2..12 yrs.			4..12 yrs.	
1..12 yrs.				1..13 yrs.	

Grade V.		Grade VI.		Grade VII.	
Chron. Age Children	Ment. Age Children	Chron. Age Children	Ment. Age Children	Chron. Age Children	Ment. Age Children
3....9 yrs.	3..10 yrs.	1...9 yrs.	1...9 yrs.	1..11 yrs.	1..12 yrs.
9...10 yrs.	4..11 yrs.	1..10 yrs.	6..13 yrs.	7..12 yrs.	4..13 yrs.
10..11 yrs.	7..12 yrs.	8..11 yrs.	5..14 yrs.	4..13 yrs.	5..14 yrs.
2...12 yrs.	3..13 yrs.	8..12 yrs.	6..15 yrs.	8..14 yrs.	7..15 yrs.
	5..14 yrs.	4..13 yrs.	2..16 yrs.	1..15 yrs.	4..16 yrs.
	2..15 yrs.		2..17 yrs.		

"Poor' Poor"! says the intelligence test enthusiast. "Think of the ineffective work being done. Consider more especially the time wasted by those children who are working with others far below their mental age." It is for them that the most earnest plea is made. Compare for example the following arraignment. The sentences are quoted from Terman because his book happens to be at hand and is especially emphatic, but many others would agree.

"The future welfare of the country hinges in no small degree upon the right education of these superior children."

– – – – – "Through the leveling influence of the educational lock-step such children at present are often lost in the masses." – – – – – "The common saying, 'genius will out' is one of those dangerous half-truths with which too many people rest content." – – – – – "Even genius languishes when kept over-long at tasks that are too easy." – – – – – "They run the risk of falling into life-long habits of submaximum efficiency. The danger in the case of such children is not over-pressure, but under-pressure."

These statements are all based upon the undebatable assertion that work should be measured out "for each child in proportion to his mental ability," it being assumed that the academic work most needed by each child is that planned in the school curriculum for pupils of the same physical age as the particular pupil has attained in mental age, *e.g.*, a girl of eleven of mental age sixteen ought to be in the second year of High School instead of in the sixth grade where she was found. Very many cases like this are cited in Terman's writings and elsewhere, the ignorance and blindness of the teachers in failing to recognize marked superiority and their unwillingness to allow the child to reap the benefit of it by being pushed ahead being held up for condemnation. The child of superior mind may be advanced for his age, but he is seldom found advanced to the degree warranted by his mental age, etc. etc.

In reply to this arraignment the writer proposes to give a brief description of twenty-five children whose intelligence quotient is 120 or above. To render this array at all significant a few introductory statements are necessary.

The writer who made these tests is a student of psychology and enthusiastic about the assistance afforded by the mental tests. She does not lose sight of the capable child in the routine of grade work if this may be obviated by mental tests, for all the children under her care are given the tests. Although she feels Terman's statements, "It would be desirable to make all promotions on the basis of intellectual ability," (presumably as measured by mental tests) to be too drastic, and that certain knowledge as well as tested power to acquire knowledge is a necessary pre-

requisite to new work, nevertheless she depends considerably upon the help afforded by the tests in making her decisions regarding reclassification. She does not oppose extra promotions for any one of the three reasons set forth by Terman, viz. 1. mere inertia, 2. unwillingness to part with especially satisfactory pupils, 3. traditional belief that precocious children should be "held back" for fear of dire physical or mental consequences. On the contrary she very frequently makes definite provision, even involving radical alterations in program or other routine to accomplish extra promotions. There is unusual opportunity to follow these up and bring them to success because each teacher has every child in the department under her care in her own subject for three years. Much of the formal work is planned on the unlimited assignment basis, so that each child may advance at his own rate untrammeled by the class.

The writer is assisted by three regular teachers, of superior education and ability, who are all in accord with her ideals. In addition there is an unscheduled teacher of special training, whose work is almost wholly with individuals, either in helping the weaker over difficulties or in assisting the stronger to work ahead.

This corps of teachers has charge of a department of sixty odd children of the fifth, sixth, and seventh grades. The school day from nine till three includes two half hour recess periods and one and a half hours of lunch and quiet rest. The program is planned to permit the utmost flexibility, it being possible for a child to recite different lessons in two grades if this seems desirable.

The relations of pupils and teachers in both work and play is unusually intimate, and for the most part there is close sympathy and understanding between home and school so that each can profit by the experience of the other.

Probably little good can be said of any course of study upon ideal psychological grounds. The curriculum of this school is that of other progressive private schools of the country. It is required that the pupils graduated from the

seventh grade of this department shall be ready to handle regular eighth grade work, *i. e.*, any irregularities in the earlier program must be directed to this end.

This department is part of a large school. There is a long waiting list and the standards are high. If it seems probable that a child cannot handle the work of the high school he is eliminated during the elementary grades, except for special considerations of character or unusual gift in some particular line, *e. g.*, music, art, etc. This means that the intelligence quotient has a different relative significance. If the average high school I. Q. is 110 as given by Terman, it will be evident that where the effort is made to receive and retain only those children likely to go through the high school, the average of the grades must be raised considerably above that of the ordinary elementary schools where all are received and natural elimination awaited. Therefore in the following pages it will be necessary to remember that an I. Q. of for example 130 is not relatively as high as when cited by Terman.

The testing was done with extreme conscientiousness in adhering to the standards, and with occasional consultation of more experienced workers. Out of the sixty-seven children of the department two years ago the following twenty-five had an I. Q. of 120 or above. The brief history given covers the school life for three years, the year of the test, and the two following years.

1. Girl. Gr. VI. Age, 11 years. 7 mo. Mental age, 14 yrs. 5 mos. I. Q. 124. Good home. Cultured parents. Undersized and immature in all ways. Freakish and very sentimental, undoubtedly due to approaching puberty. Intends to be a novelist. Sleeps with note book under pillow ready to record inspirations. Gets a notion that a certain subject is hard and fails in it for weeks, then as soon as this improves conceives the idea that she never could do some other subject and goes down accordingly. Writes a very large hand, after much correction and copying for days or weeks suddenly adopts a microscopic hand, then begins writing letters separately, l-i-k-e t-h-i-s. Pities herself a great deal and tries to appear stupid. Every year it has been a great struggle to keep her up to a promotion standard, each year growing a little more difficult as greater maturity was expected of the class and she is apparently on a plateau of development, from which she will in all probability

rise with great suddenness after two or three years. Last year she failed in all thought work, seeming like an immature baby in class discussions. She was taken out of regular work about the middle of the year and given supplementary work. This year, repeating the seventh grade she is doing average work and a great deal of quiet thinking. Delicate, subject to colds.

II. Girl, Gr. V. Age 9 yr. 6 mo. Mental age, 11 yr. 10 mo. I. Q. 125. Very tiny and shy. Like a baby in her point of view. Good mental reactions but very slow. I. Q. would be higher were it not for some of the time tests. Repeated the fifth grade last year because all subjects were below promotion standard. Used to burst into tears when asked to recite and declare that it was too hard. This was partly due to the fact that the fifth grade year when the test was given was her first year in school, due to delicate health in early childhood. This year in the sixth grade she is doing strong work and is much respected by the class.

III. Girl, Gr. VII. Age, 12 yr. 9 mo. Mental age, 16 yr. I. Q. 125. Father a professional man in responsible executive position. Child beautiful in body and character, loved by everyone, a dreamer and a poet. Almost impossible to keep her down to definite statements or exact conclusions. Mathematics a year long struggle with many failures and "conditions." Grammar difficult, history dependent upon type of work and personal mood. Not lazy, but so dreamy that constant pressure must be exerted if she is ever induced to look beneath the surface. Her eighth grade record was not different from all before. She is now repeating her first half year of high school because of many weeks lost from influenza.

IV. Boy, Gr. VI. Age, 11 yr. 3 mo. Mental age, 14 yr. 2 mo. I. Q. 126. Extreme neurotic. Every muscle tense. Hand work, including writing, almost impossible. Hands almost like those of a paralytic. Has had expert instruction to gain muscular control. Repeated Gr. V. Sees point of problem or situation quickly, but is so verbose and inconsequential that he cannot stick to any one topic but rambles on and on till stopped. No idea of brevity or organization. Covers half a page with a one process problem. Has poor idea of sentence structure, often having several consecutive groups of words with no verb. Naturally it is very hard for him to learn the use of even the commonest punctuation marks. Failed in all seventh grade subjects except geography and was given a special supplementary program. This year is repeating the seventh grade and is doing average work, although still not fully in control of himself.

V. Girl, Gr. VII. Age, 12 yr. 3 mo. Mental age, 15 yr. 4 mo. I. Q. 125. An all round satisfactory pupil in all respects. Her somewhat delicate health and the fact that she takes all work rather

slowly and must feel a sense of thoroughness if she is to be happy in her work and not worry, have made it never seem possible to advance her with any greater speed. Gives much time to music, which is to be her life work. In high school as in eighth grade and earlier elementary she is always charming, always successful, always beloved.

VI. Boy, Gr. VI. Age, 12 yr. 5 mo. Mental age, 15 yr. 6 mo. I. Q. 125. A good natured, faithful lad, plodding away at whatever he is told may help him. Entered this school in the fifth grade when it was discovered that he could not read. Parents had been vaguely troubled but the teacher had told them that he was "such a fine lad." Seemed unable to connect ideas with symbols and failed in all text-book work. Mathematics good. Repeated Gr. V., with expert individual work in reading. In the sixth grade read aloud intelligently, although haltingly. Good substantial work in the seventh grade, although all English subjects were difficult and he was markedly inaccurate, seldom bringing any task to a conclusion without at least one glaring error. In the eighth grade his work is average, but his depth of interest as a student steadily increases.

VII. Boy, Gr. V. Age, 9 yr. 6 mo. Mental age, 12 yr. 2 mo. I. Q. 128. Son of physician in position of great responsibility. Mother unusually intelligent. Undersized and babyish. In fifth grade never volunteered or made any sound unless forced to do so. So slow in execution that one or two problems or a half dozen sentences represented an hour's work. Gave correct, very brief replies, often showing excellent thought in oral lessons under compulsion and was considered markedly intelligent in home activities. Afraid of rough games of children of his age, preferring little children. In the sixth grade did not seem to have advanced at all in development. Repeated the grade this year and although still very quiet, is doing excellent work and showing the qualities of a real student.

VIII. Girl, Gr. V. Age, 10 yr. 11 mo. Mental age, 14 yr. 1 mo. I. Q. 129. Satisfactory in all subjects, she impressed no one as having any great depth of feeling or thought. Bright, vivacious, much petted by older pupils. Left at end of sixth grade to go to another school.

IX. Girl, Gr. VII. Age, 12 yrs. 4 mo. Mental age, 16 yr. 1 mo. I. Q. 130. Keen and quick, inaccurate and superficial. Skipped one or two grades in earlier years and had to repeat grade VII just to grow up to herself. Was too immature to manage the situation, lost papers, forgot assignments and had no conception of the human import of topics discussed in history, industrial geography, civics, etc. On repeating, did fair work and has progressed in eighth grade and high school so far without "conditions." She excels in algebra and grammar but sees little in literature or history.

X. Girl, Gr. VII. Age, 12 yr. 8 mo. Mental age, 16 yr. 5 mo. I. Q. 130. Strong and charming personality. Great promise of capability. Does creditable work the last quarter of each year, but is so slow in making adjustments to new personalities, topics, vocabulary, etc., that the first part of the year is a struggle against failure. Has poor methods of work; slow and blundering in execution; always loses her place, breaks her pencil, etc. Cannot spell and has great difficulty in acquiring correct terms, amounting almost to Mrs. Malaprop at times. Special difficulty with mathematics. Is repeating the first term of high school due to time lost in influenza.

XI. Girl, Gr. V. Age, 10 yr. 8 mo. Mental age, 13 yr. 10 mo. I. Q. 130. High pitched, babyish voice and superficial prattle. Very keen visualization and imagination. Can learn anything but has no depth of appreciation in literature and does poor work in history and geography through lack of comprehension of relations. Was a problem during primary grades on account of her inattention and lack of respect for the rights of others.

XII. Boy, Gr. V. Age, 10 yr. 8 mo. Mental age, 14 yr. 1 mo. I. Q. 132. Extremely nervous and tense but bright and capable and increasingly successful. Very naive and childish, causes great amusement to other children.

XIII. Girl, Gr. VI. Age, 11 yr. 9 mo. Mental age, 15 yr. 10 mo. I. Q. 135. Unusually capable parents. Child of fine, strong personality. For several years cared only for mathematics and would study nothing else. Declared with tears that she could not study history and geography. Had great difficulty in gaining promotion to the seventh grade in these subjects. Months of tutoring, summer work, make-up examinations, etc., sent her into the seventh grade radiantly successful but with her interest in mathematics somewhat alarmingly diminished. Her year in the seventh grade was one of remarkable student activity for a child of twelve, voluntary research work, etc. We greatly regretted it when she entered the high school of another school.

XIV. Girl, Gr. V. Age, 11 yr. 1 mo. Mental age, 15 yr. I. Q. 135. Skipped third grade on general ability but failed flatly in fifth grade because of back work superficially covered and also because her self-satisfaction was so great that she could not be induced to work. Repeated fifth grade well and in the sixth grade did work a little above the average although not as good as several children of a lower grade of mentality. In the seventh grade her complacent indolence causes much trouble. She does poor work till on the brink of failure, then shows her ability by bringing everything up suddenly, only to lapse again. Poor attitude toward classmates.

XV. Boy, Gr. VI. Age, 11 yr. 5 mo. Mental age, 15 yr. 7 mo. I. Q. 136. A great problem at home and at school. Learns easily but is satisfied to recite big words like a parrot and lacks force and depth of character. Written work almost illegible. Very suggestible, he will not stand up for his really good ideas if others demur, and he yields to every temptation. When reproved he looks up with a sweet, vague face to explain how others "did it first." Did not seem to develop at all in three years. Has gone to another school.

XVI. Boy, Gr. V. Age, 10 yr. 4 mo. Mental age, 14 yr. 1 mo. I. Q. 136. Eminently satisfactory in work. Delicate in health. Earnest and painstaking. Left after one year.

XVII. Boy, Gr. VI. Age, 10 yr. 6 mo. Mental age, 14 yr. 5 mo. I. Q. 137. A very clever baby. Undersized and frail in body. Has lacked the grasp on vital relations and human problems which one expects of a boy of his age to say nothing of his mental age. Good in mathematics; literature and history are little but memory work. Has no message for the world in composition. The amusing faults, petty deceits, etc. of a very little boy. Each of these statements has grown less and less true year by year, until now in his first high school year we find him grown considerably, rather less shy, acquiring more friends, and getting a stronger grasp of all work. The same general characteristics still persist, however.

XVIII. Girl, Gr. V. Age, 10 yr. 5 mo. Mental age, 14 yr. 6 mo. I. Q. 139. A sweet frail little girl, very conscientious in all moral situations but lacking pride or conscience regarding the quality of her work. Would not do anything at all better than she was absolutely forced to do. Marks slightly above average in thought, verging on failure in appearance of papers. Slow and inaccurate. There has been a slow, steady improvement, until now her work is seldom criticized, but she is so quiet and unaggressive as to make almost no impression upon class sentiment or opinion.

XIX. Girl, Gr. VII. Age, 11 yr. 10 mo. Mental age, 16 yr. 9 mo. I. Q. 142. A marvel of efficiency in all directions, perfect health, remarkable speed in execution, remarkable maturity of thought and perception of inner relations. Not popular with classmates, who are annoyed and amused by her naive self-esteem and childish exuberance of joy in her own success. Now in high school. Probably her adjustments are better, but there is still painful disparity between her immature impulses and conceits and her maturity of intellectual grasp.

XX. Boy, Gr. V. Age, 10 yr. 3 mo. Mental age, 14 yr. 11 mo. I. Q. 146. Remarkably intelligent parents. Always a drag in class, making promotions with heavy conditions. Withdrawn at end of first year to join very small class. Undersized. Droll, old

way of talking. Remarkable thought when not hurried. Incapable hands so that written work was a failure. Poor speller. Slow in calculation so that oral arithematic was poor. Almost incapable of getting an explanation or following a direction unless given very slowly to him alone. Looked dazed most of the time in class and replied at random.

XXI. Boy, Gr. VI. Age, 11 yr. 6 mo. Mental age, 16 yr. 11 mo. I. Q. 147. Excellent mind for grasping full import of very mature thought but no student quality. Gets a great deal in brief time but never the most because he will not work for it. All this was true in sixth grade. In high school he seems to be attacking the wrok with slightly more pride and strength.

XXI. Boy, Gr. VI. Age, 11 yr. 11 mo. Mental age, 17 yr. 8 mo. I. Q. 148. Parents not of exceptional ability. All round in attainments but not at all above level of grade. Too conceited to put forth great effort. Required a good deal of prodding to keep him up at all. Left at end of first year.

XXIII. Boy, Gr. VI. Age, 11 yr. 9 mo. Mental age, 17 yr. 4 mo. I. Q. 148. Good in all lessons. Conspicuous for his initiative and originality in practical affairs. Faithful in the performance of required tasks, he rather prides himself about not being "roped in" by any scheme of the teacher for getting any extra work out of him. Never volunteers for unnecessary topics. Uses his brains to save himself unnecessary exertion. During the last two years has shown some real pleasure in success in mathematics and willingness to work for that pleasure.

XXIV. Boy, Gr. V. Age, 9 yr. 11 mo. Mental age, 15 yr. 7 mo. I. Q. 157. Moved to another city at end of sixth grade. The most casual observer would have picked him out as a boy of unusual intelligence. His written work was so poor, however, and he made so many false strokes, so often got the wrong answer by the right process, or forgot to read all the problem, or lost his paper, or mislaid his book, or said the wrong date when he knew better, just from general blundering eagerness, to say nothing of the times when exuberant spirits wound up in a time-consuming snarl of some sort, that it was a constant care to his teachers, allbeit amusing and fascinating, to keep him up to the average of his class. Furthermore, his infantile gambols and naive observations rendered ludicrous the idea of class-room companionship with boys of fifteen.

XXV. Gr. V. (VI soon after test was taken) Age, 9 yr. 8 mo. Mental age, 15 yr. 4½ mo. I. Q. 159. A year later I. Q. 170. When this remarkable test was sent to Terman and Goddard two years ago both advised rapid advancement, the latter openly saying that the child should be given work of high school grade.

The boy was practically tutored by the special teacher for half a year, during which time he made up nearly a year's work and was placed in the grade ahead. Here he stayed by dint of relentless prodding on the part of the writer. This he took with the utmost good nature and amusement, even gratitude. "I should never have had the *A* if you hadn't made me." Whenever there was a difficult new subject presented he glowed and sparkled. He got it all ahead of anyone else, but he would not go home and do the patient digging required of the other children and needed by him to fix facts in his mind. He reveled in history and read a great deal, but superficially and failed in daily lessons. He could explain any problem and point out the mistakes of other pupils, but he seldom attained the right result to a problem of any length because he didn't stick at it long enough, ignored some of the conditions, etc. Although he had a marvelous vocabulary and power of imagery and sense of humor his composition was poor because he could not spell and it was so much trouble to write things that he stated them in the briefest and most meagre style. There was always some reason why the task could not be done when assigned till his work dragged behind in a manner to drive an intelligence test idealist to distraction. No one who ever worked with hin for an hour doubted his remarkable ability, but how to achieve results? Tutored he could really become one of the child prodigies, but he surely needs social life, for he is a poor mixer with those of his own age, a poor sport, and his humor and quickness in conversation are suitable for grown up companions rather than for children. Furthermore, he is delicate in health. It was definitely planned to have him take two years for the seventh grade in order to attain a maturity and acquire methods of work which would promise some hope of success in the eighth grade which is a part of the high school department and which cannot make a boy sharpen his pencils and pursue him when he loses his books or needs to wash his face.

In repeating the grade this year under a new teacher he started with failure in all subjects. The teacher could not believe that he had ability. Then she placed him in charge of a project to collect and organize current events clippings. In this distinguished position he has worked most diligently and his general work has improved somewhat.

Here they are, my twenty-five little men and women. What lesson do they teach us? To many the first thought is, "The mental tests are not a reliable index of the child's ability and have small value for us as teachers." "Look at that boy with an I. Q. 125 repeating his grade and this girl with I. Q. 130 struggling to keep up her mathematics." Naturally we must all recognize limitations in quantitative measurements when applied to personality. The

biggest things in life are not measurable. There is no test for character or will power, nor any index which will show that one child is so constructed as to keep much in reserve, while another gives all of himself so that a test reveals the uttermost of which he is capable. Nevertheless the writer is increasingly disposed to attach importance to the tests and to rely upon them for prognostication of a child's future achievements. By and large they tell the truth as to the child's potential ability to grapple with situations.

Nearly all persons using mental tests without regard to physical age have found a good many inconsistencies in their groups. Not only are children with high I. Q.'s found doing poor work, but sometimes those with low I. Q.'s are seen to be doing good work. The former are usually the clever babies who are being compared in steadiness, reliability, and emotional reactions with children two, three, or four years older; the latter are temporarily comparing favorably with much younger children.

Dr. Goddard, Dr. Terman, and others who would have us believe that a fifteen year old boy with an I. Q. of 100, a ten year old boy with an I. Q. of 150 and a twelve year old boy with an I. Q. of 125 can be classed together because their mental age is fifteen years, are ignoring what seems to me the fact that maturity of character, emotions, and instincts do not follow intelligence levels as closely as they do physical development, expecially in the early adolescent period and just before.

It is very desirable that ten year old children with I. Q.'s of 150 should be classed with other ten year old children with similarly high I. Q.'s, not with those of fourteen or fifteen with I. Q.'s around 100. So grouped the superior children can be placed under demands suitable for them and their reactions will invariably be very different from those of low I. Q.'s of the same chronological age.

It seems equally clear, however, that one cannot convert this power with unfailing certitude into academic success along paths uniformly laid out. It is not enough to say with Goddard and Terman that such children are not permitted to do what they might, meaning simply rapidity of advancement, nor that, "Wherever located such children rarely get anything but the highest marks, and the evidence goes to show that most of them could easily be prepared for high school by the age of twelve years."

1. The very excellence of such minds as these renders them individualized and forceful so that many of them will not docilely accept subject matter with no vital bearing for them, depending upon memory and doing the expected thing as the mass of children do.

2. To a very large extent these children are poor in muscular control and hence find writing very difficult. Under the most liberal interpretation our school routine demands a large amount of written expression. Many of them are neurotic and have uncertain control in many directions, little power of inhibition, or strength of will to concentrate.

3. It is characteristic of a large percentage of these children that they see the essential principle at once and have a loathing for detail and elaboration. Hence the elementary years, which are the years for acquiring the tools of education are difficult ones. Such a child says, "I know how to do it, I just made a mistake in the work." In many cases of which the writer has personal knowledge the result has been that scarcely any problem or task was ever carried out to a successful conclusion. Only the first original thinking held the attention; the rest was drudgery to which they would not submit and unless unusual wisdom is employed in the direction of such children, their lives will continue to be freighted with brilliant possibilities and actual failures, since a large part of life must be given to execution. "Allowing" such children to hurry along over failures and get into high school does not offer a solution.

4. There are other sides to life besides the academic. Some children are going to use their high intelligence in meeting practical situations and try as they will they cannot hitch it up to school requirements. As I write I can lift my eyes to a building which is regarded as one of the greatest architectural and mechanical (mathematical) feats of America. The man who drew the plans and worked out the calculations was a boy who could not progress in school, being expecially deficient in mathematics. He educated himself by reading what he pleased and when the need for mathematics came the ability was there. It is not true that the work of such children is always superior in whatever grade they are found.

5. Probably most children of this grade of intelligence could be given the mathematics and language work of the high school several years earlier. But high school courses are planned for adolescents,

and the brilliant pupil of ten or eleven has the instincts and emotions of a little child. He is not prepared to grasp the import of high school literature, history, civics, or ethics or to expand in the adolescent atmosphere, to respond to the student government, the athletic code of honor, the interplay of personalities in the friendships of youth. He has intelligence but he has not yet lived or felt.

With the parenthetical qualification that a large part of the mental and moral poise of a community is due to its average men and women doubtless we should all accept the statement that "the future welfare of the country hinges in no small degree upon the right education of these superior children." "The responsibilities of those who deal with them are very great." The crux of the matter lies in these words "right education."

The almost universal public school verdict all over the country has been, "get the bright children through school as quickly as possible and out at work or into high school or college. Save their time!"

The reasons for this attitude are easy to see. One is economic pressure. The children must get to work as soon as possible. If they are to enter professions they must not delay the beginning of their preparation. Another reason is the nature of the public school requirements. It has been shown that a faithful child can go through the public schools, grade by grade if his I. Q. is 90 or above. If, therefore, one is planning for I. Q.'s of 125 or above with no alteration in curriculum the only thing to be done is to advance them very rapidly. Thus the only advantage accorded by the educational system to the superior mind is the curtailment of his school life!

Is this not offering a stone in the place of bread?

One authority writes; "I have no sympathy, myself, with the cry that our young people must get into higher institutions earlier. Anyone who has had contact with young people leaving home at eighteen years of age to go to college– – – – – will certainly feel satisfied that they are none too old for the adventure." Harvard shows successful academic records for its sixteen year old freshmen, but there are instructors there who feel that they would have received much greater benefit in the larger college life had they prolonged their preparation in more intensive study.

Has the time not come for us to work purposefully on the question of differentiation in course of study for the supernormal children, just as so many people have worked to meet the needs of the subnormal?

There are certain mechanical tasks over which there is no advantage to linger. There is no use in holding back the natural speller or the child who learns to read as easily as to talk. But certainly there should be opportunities given the child of this type who also has superior intelligence to use his ability in more intensive work in history or literature, in more applications of the same principle in mathematics than can be attempted by the child who is struggling with the tools. If the bare requirements of a grade demand the crossing of a field of history by a single path, the gifted child ought to be enabled to wander in that field by many paths; he ought not to be hurried into the next field after the same meagre glimpse. We are always told that it is not the intention to hurry into college those immature in judgment, physical development, instincts, emotions, and the like, that the pupils to be advanced are not merely the keenly intellectual, but those of all round development, mind, body, character. I have sought for such children and I have not found them. I have asked many people in high school and college work, and physicians. The usual answer is, "If they exist, I haven't known them."

Instead of encouraging the bright children to spend all their time on school subjects in order to get ahead, thus becoming still more academicized than they are, might we not use their keener minds in part to reduce the time spent in lessons, supplying instead more of those activities which the intellectual so especially need? First, joyous recreation and vigorous free play, more than they can get in two or three gymnasium periods a week. The physical record of school children is nothing to be proud of, even in the best of schools. Eye defects, neurasthenia, spinal curvatures – – – increase grade by grade. It is true that a majority of the people of distinction and leadership are neurotic. But neurotic children of brilliant promise cannot attain success unless they are helped to sound bodies and as much nerve poise and control as possible. The keen, brilliant child would seem far less in need of intellectual activities such as current events or science clubs than of swimming, long hikes and the like.

Second, more time might be saved in these children's education for music, art, and industrial work of many sorts.

It may reasonably be asserted that the needs of many bright children would be better served by such methods as the above, than by being rushed into college a couple of years earlier with only the same number of technical requirements fulfilled as in the case of the slower minds.

And then what about those other types already cited – – those who have great difficulty with the technical school work of the early years; or those who seem doomed to inevitable failure by their superficiality, and by the very ease with which they can get along somehow? What are their real needs?

MENTALITY AND SCHOOL PROGRESS

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A recent very interesting article by Kornhauser (*) makes use of Yule's association coefficient, Q, as a measure of the relationship "between intelligence of children, measured crudely by school advancement, and the economic standing of parents, measured still more crudely." The possession or non-possession of a telephone was used as a measure of the parental standing in regard to wealth. His final association coefficient of +.61 between Advanced and Telephones, Advanced and Not Telephones, Retarded and Telephones, Retarded and Not Telephones was found by disregarding the two classes, Normal and Telephones and Normal and Not Telephones. Had he included all normal cases with the advanced cases, he would have secured a much lower coefficient, Q = +.30 for the four (now different) classes, Retarded and Telephones, Retarded and Not Telephones, Normal and Above and Telephones, Normal and Above and Not Telephones. The size of the coefficient is materially affected by leaving out the normal group, evidently depending upon the number of the normal group eliminated in the calculation of the coefficient. A coefficient so obtained, however, gives us a better answer to the question with which most of us are concerned, namely, "Are the extreme members of the one series also at the same extreme in the other?"

The procedure used in the article cited has suggested to the writers the use of a similar procedure with the data on hand in regard to the relation of school grade to mentality, a perfect or nearly perfect correlation of which was assumed in Kornhauser's investigation. Are there any conditions under which school grade may be taken as a perfectly reliable index of mentality? If there are such, broad problems, such as Kornhauser has dealt with, may be solved without resort to actual mental testing of large numbers of children.

The problem which we set for ourselves then is: Can we in this investigation select our lines of division, by eliminating a middle or normal group either of school grades or of mentality, or both, so that school subnormality shall always mean mental subnormality,

*KORNHAUSER, A. W. *The Economic Standing of Parents and the Intelligence of Their Children.* Jour. of Educ. Psych., Vol. IX, No. 3, 1918. pp. 159–163.

and school advancement always mean mental advancement? Or, since we can readily ascertain a child's grade in school, can we find limits such that, to be in a given grade at a given age shall always mean a given mental diagnosis? The conditions necessary for the solution of the problem will have been fulfilled if we can determine limits such that the resulting Q shall be +1.00.

METHOD AND RESULTS

Three schools, A, B and C, were given a series of group mental tests. (*) The children of school A were of superior social status, those of B of medium social status, while those of C were of inferior social status. A median mental age was computed for each child and from this the intelligence quotient, I. Q., calculated. In the absence of directions to the various examiners in that regard, some required the children to give their age on their last birthday, while some gave no directions at all. The best assumption under the circumstances thus seems to be that all children who reported their age as eight were past their eighth birthday. That this is a fair assumption is shown by the fact of our final selection of grades, 3B and 3A, to represent the "normal" grade for eight-year-old children, and by the percentages of school retardation and advancement thereby secured.

The formula for Q, used throughout this investigation, is:

$$Q = \frac{(AB)\ (ab) - (Ab)\ (aB).\dagger}{(AB)\ (ab) + (Ab)\ (aB).}$$

The various procedures and the limiting values used in each are given in Table I, Part I, and the resulting Q's are given in Part II of the same table. The conditions of the table are all given as for age 7, the corresponding conditions for all other ages being of course understood. All the procedures include all the ages and the Q in Part II of the Table is for all the ages concerned. Thus, Procedure I includes all ages from 6 to 16. For age 8, the school divisions would be 3B and below, 3A and above; the mental divisions, 7.9 and below, 8.0 and above. For age 9, the school divisions would be 4B and below, 4A and above; the mental divisions, 8.9 and below, 9.0 and above. And so on for all the other ages. The Table merely illustrates by showing the method at age 7, but the Q's are calculated by using all ages.

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*PINTNER, R. *The Mental Survey*. 1918, pp. 40-50.

†YULE, UDNY. *An Introduction to the Theory of Statistics*. 1916, p. 38.

TABLE I.

The Conditions and Limiting Values Used in the Computation of Q by the Various Procedures, and the Q's Derived Therefrom (All conditions given as for the age 7.)

Procedure	I					II
	School		Mentality		Ages	
	A	a	B	b		Q
I	2B and below	2A and above	6.9 and below	7.0 and above	6 to 16 inclusive	+.56
II	1A and below	2B and above	6.9 and below	7.0 and above	6 to 16 inclusive	+.646
III	1A and below	2B and above	6.9 and below	7.0 and above	As of Proc. III	+.654
IV	1A and below	3B and above	6.9 and below	7.0 and above	As of Proc. III	+.85
V	1A and below	3B and above	I. Q. of .89 or below	I. Q. of 1.10 or above.	As of Proc. III	+.97
VI	Retarded 4 grades or more	Advanced 2 grades or more	I. Q. of .89 or below	I. Q. of 1.10 or above	As of Proc. III	+1.00

Procedure I. Massing together all of the 1723 children of the three schools, we first considered all 7 year-old children in grade 2A or above as "Above normal," all in 2B or below as "Below normal." In mentality, all above the median mental age 7.0 were considered mentally "Above normal," and vice versa, and similarly for all the other ages. QI is then +.56, which is a comparatively low value. That this figure does not best represent the relation of the intelligence of school children to their grade in school is shown by the fact that there are more than 73 per cent retarded pupils in the school by this procedure. Hence it was decided that it was probably better to compute Q, using as below normal in school all those children of age 7 who are in grade IA or below.

Procedure II. With the above limit for school "Below normal," we obtain a QII of +.646. With this limit we have 46.2 per cent of below normal children in the three schools. This seems to be more nearly in accord with the percentage we should expect, and furthermore, is more in accord with the common sense view of a 7 year-old retarded child being one who has not yet been promoted to the second grade.

Procedure III. An attempt at computation at this point of the Q values for each age separately discloses the fact that such values cannot be calculated at all for those ages in which all of the pupils are either retarded or advanced by the above criterion. In schools A and B, both of which had junior high school courses or a ninth grade, all pupils of age fifteen or above are evidently retarded by the above criterion; similarly with all those of age fourteen and above in School C which had no ninth grade; and all children of age six are advanced in all three schools. From our total figures, then, should be subtracted all those children who have not an opportunity to be either retarded or advanced in school. If we do not do this, we are evidently not getting the value of Q we should by reason of the fact that at the one extreme the brighter and more advanced children of age fifteen and over are now in high school or at least graduated from the grade school, while at the other extreme, we have too many advanced pupils by reason of the fact that a six-year-old cannot be retarded at all because of the ordinary practice, assumed in this problem, that the age at entering school is six years.

Omitting, then, those ages in which all children have not a chance to be both retarded and advanced in school *at least one year*—that is, ages, 6, 14, 15 and above in Schools A and B, and ages, 6, 13, 14 and above in School C—gives us a total QIII of+.654. From Table II, which gives the Q—values by ages, it is quite apparent that the adjustment of mentality to school grade by means of re-

TABLE II.

Q—Values by Ages and By Schools for Procedures, III, IV and V.

	Calculated Q—Values:—										
	Age:—							School:—			
Procedure	7	8	9	10	11	12	13	A	B	C	Total
III	—.25	+.73	+.91	+.90	+.60	+.81	+.66	+.49	+.67	+.83	+.654
IV	+.34	.90	.96	1.00	.70	.96	.76	.78	.79	.94	.85
V	+.29	1.00	1.00	1.00	.87	1.00	1.00	.91	1.00	.996	.97

tardation has barely begun at age 7. By omitting age 7 also we secure QIII a= +.72. This, however, seems unfair as this age, which can be retarded in school not more than one year, should be left in to compensate for the age at the other end of the series which cannot be advanced in school more than one year. Accordingly

age 7 is included in all further computations, while all ages which have not the possibility of being retarded and advanced in school at least one year have been eliminated as outlined above.

Procedure IV. An inspection of a distribution table of children by years of retardation and advancement showed conclusively that the Q—values are not higher than they are chiefly because of the variation of the group of "normal" school children. We, therefore, proceeded to calculate Q with the school "Normal" children eliminated— that is, with all 7-year-old children in grades 2B and 2A eliminated, and correspondingly for the other ages. We thus secure QIV = +.85. This is to be regarded as a coefficient representing the relation for all three schools combined of the four classes: School Retarded and Below the Median in Mentality, School Retarded and Above the Median in Mentality, School Advanced and Below the Median in Mentality, School Advanced and Above the Median in Mentality.

Procedure V. While the above coefficient, QIV, is sufficiently high to indicate a very high degree of relationship between mentality and school grade, the coefficient is not such as to warrant our using school grade as a prediction of mentality. If, by eliminating from our mentality distribution also a middle class such that we secure a nearly perfect Q for the four classes, School Retarded and Mentally Retarded, School Retarded and Mentally Advanced, School Advanced and Mentally Retarded, School Advanced and Mentally Advanced, then we may say that such-and-such an amount of school retardation almost certainly means such-and-such a degree of mental retardation as determined by the limits finally assigned. To secure comparable measurements of mental retardation at different ages, the I. Q. values were computed. Various limiting I. Q. values for the middle class were tried out. The final selection coincides, in all but the division between the bright-very bright, with the C. I. A—values used by the writers with the Point Scale for making diagnoses into the groups, "Feebleminded, Backward, Normal, Bright, Very Bright." The limits used and the percentages falling in each diagnostic group are shown in Table III. The resultant percentages show this selection to be reasonably accurate as to the diagnostic limits involved, according to the generally accepted views as to the distribution of I. Q.'s of school children where large groups are taken. This procedure results in a QV—value, when "normal" school and "normal" mentality groups are eliminated, of +.97. The actual distributions in numbers by grades and by diagnosis are shown inTable IV.

TABLE III.

I. Q. Diagnostic Limits, and Distribution of Diagnostes by Percentages.

Diagnosis	I. Q. Limits	percentage:— Procedure III	All Ages
Feebleminded	Up to .69 (inclusive)	1.5	2.0
Backward	.70 to .89 (inclusive)	18.6	21.9
Normal	.90 to 1.09 (inclusive)	51.2	50.3
Bright	1.10 to 1.29 (inclusive)	24.1	22.4
Very Bright	1.30 and above (inclusive)	4.6	3.4
	Total	100.0	100.0

TABLE IV.

Distribution in Numbers of Children, by Diagnosis and by Grades of School Retardation or Advancement. (All schools and ages of Procedure III. A minus sign indicates retardation, and plus indicates advancement. Two grades are included in the "normal" group.)

Grade	Number at Diagnosis:—					Total	
	F. M.	B.	N.	Br.	V. Br.	No.	Per Cent
—8	1	..	..	..	..	1	0.1
—7	2	..	..	..	..	2	0.2
—6	3	4	..	..	..	7	0.6
—5	5	8	5	..	..	18	1.5
—4	1	24	7	..	..	32	2.6
—3	1	36	25	4	..	66	5.4
—2	2	49	74	13	..	138	11.3
—1	3	50	94	36	1	184	15.1
N.	..	50	360	147	28	585	48.0
+1	..	6	42	81	18	147	12.1
+2	..	..	12	11	4	27	2.2
+3	..	..	3	2	5	10	0.8
+4	..	..	1	..	..	1	0.1
Retarded	18	171	205	53	1	448	36.8
Normal	..	50	360	147	28	585	48.0
Advanced	..	6	58	94	27	185	15.2
Total:							
Number	18	227	623	294	56	1218	..
Per Cent	1.5	18.6	51.2	24.1	4.6	..	100.0

The formula for Q is imperfect for the reason that, in this case we have a relatively very large "School Retarded-Bright and Over"-group in comparison with the "School Advanced-Backward and Under"-group, and yet Q is nearly perfect. For this reason we have reduced Table IV to a form (Table V) showing by *years* of retardation and advancement just how many chances out of one hundred a child of a given degree of retardation or advancement.

TABLE V.

Chances Out of One Hundred of Falling in a Given Diagnosis, By Years of Retardation and Advancement.

School Years	Chances in 100 of Diagnosis					No. Cases	Per Cent
	F. M.	B.	N.	Br.	V. Br.		
—4	100	..	..	..	..	3	0.3
—3	32	48	20	..	..	25	2.1
—2	2	61	33	4	..	98	8.0
—1	2	31	52	15	..	322	26.4
N.	..	9	62	24	5	585	48.0
+1	..	3	31	51	15	174	14.3
+2	..	..	36	18	46	11	0.9
No. of						Total	100.0
Cases	18	227	623	294	56	1218	..

collectively, has of falling into each diagnosis. By reference to Table V, we see that a 11 year-old child in the third grade (3 years retarded) has about one chance out of three, $\frac{32}{100}$, of being feeble-minded, and four chances out of five, $\frac{80}{100}$, of not being above backward, with absolute certainty, $\frac{100}{100}$, that he is not above normal in mentality.

Procedure VI. By reference to Table IV, we see that no individual who is four or more grades retarded in school is above normal in mentality; also, that no individual who is more than one grade advanced in school is below normal in mentality. With these, limits, than, for our "normal" mentality group, we secure a perfect positive association, QVI = +1.00.

By calculation from the summation figures of Table IV, we find that there are 36.8 per cent. below normal in school, with only 20.1 per cent. below normal in mentality. On the other hand, there are only 15.2 per cent. above normal in school with 28.7 per cent. above normal in mentality. This seems to suggest that there are from 12 to 16 per cent. of the children of the three schools retarded in school and yet possessing mentality such as to enable them to do at least normal work. There is an equal percentage who are only normal in school and whose mentality is such as to enable them to do advanced work. We find 32.9 per cent. of the "normal" mentality group retarded in school, 18.0 per cent. of the "bright" group and less than 2 per cent. of the "very bright" group. Our results,

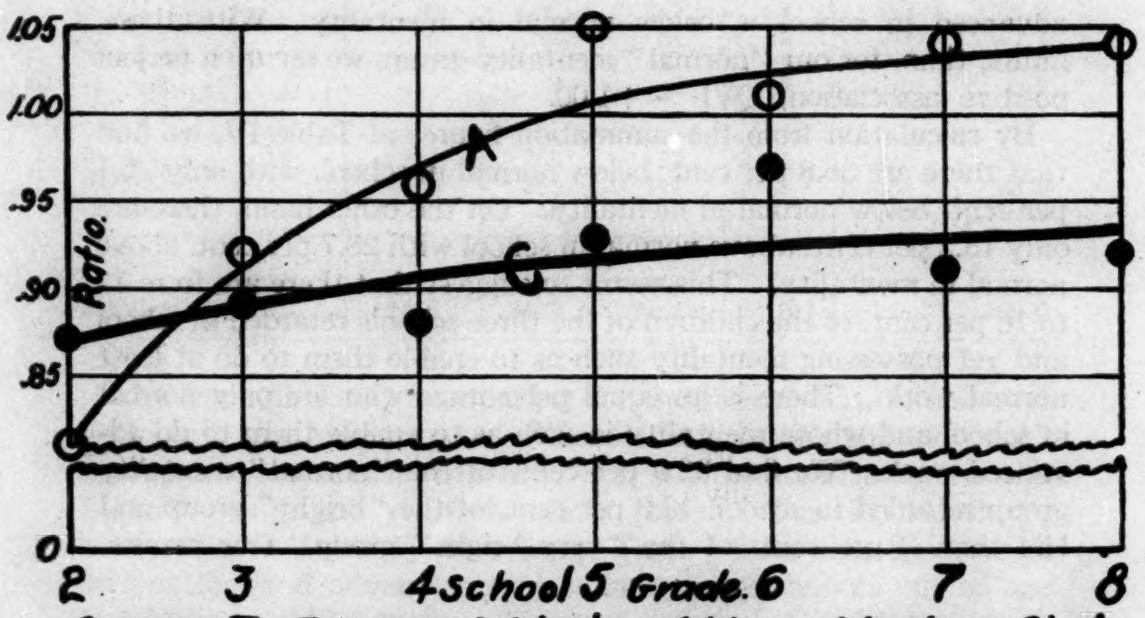
when school performance is measured in terms of school retardation and advancement, may possibly be best interpreted in the light of observations made by Whipple:*

"When ability is strikingly superior, school performance is superior, whether the student is industrious or not. When ability is strikingly inferior, school performance is quite inferior whether the student is industrious or not. When ability is of average amount, school performance is distinctly affected by industry and zeal. Most of the divergences between test results and the school records or the teacher's estimates pertain to the position of these students of average native ability."

May not even the presence or absence of industry and zeal be almost wholly dependent upon the school's willingness or unwillingness to recognize such virtues by the reward of school advancement?

In an effort to secure some light on this question, we have plotted, (Graph I), for Schools A and C, the curves of the ratio of the median mental age at each grade divided by the corresponding median

*WHIPPLE, G. M. *The Use of Mental Tests in Vocational Guidance.* Annals of the American Academy of Political Science, No. 65, 1916, pp. 195-204.



Graph I. Ratio of Median M.A. to Median Ch. A.

chronological age. If the median mental age with advance in grade increases faster than the median chronological age, then the difficulty of passing each successive grade is probably on the increase. Inasmuch as an increase in the ratio used as a measure of this may be due to the nature of the units used, we should compare the *rates* of increase of the curves rather than the absolute amounts of increase. We see that School A, of highest status, has a consistently greater rate of increase than School C, the lowest in social status, and which is taken by way of affording a good contrast. Accordingly, since it is harder in School A for a child of normal intelligence to pass each successive grade than for a similar child in School C, we should expect School A to have much the larger percentage of retardation. Actually, however, School A has a smaller percentage, 33.5 for the entire school as compared with 38.4 similarly for School C. A possible explanation, although one on which we have no data, is that perhaps School A eliminates a larger percentage of those who lag behind the normal rate of progress. In School A we find much smaller percentages of very badly retarded pupils than in School C. School A consistently has the lowest Q-values of the three schools, such as we might be led to expect where the standards are changing the most rapidly from grade to grade. Whether increasing standards and a lower Q-value are desirable, hinges upon a question of school policy, "Shall we have high standards and fewer 'educated' pupils, or shall we have lower standards more nearly perfectly suited to those at the lower end of the mentality scale and a larger number of 'educated' pupils!".

SUMMARY

1. The association coefficient, Q, for the relation of the four classes, School Retarded and Below Median in Mentality, School Retarded and Above Median in Mentality, School Advanced and Below Median in Mentality, School Advanced and Above Median in Mentality, was found to be +.85.

2. Q, for the classes, School Retarded and Mentally Backward or Below, School Retarded and Mentally Bright or Above, School Advanced and Mentally Backward or Below, School Advanced and Mentally Bright or Above, was found to be +.97.

3. Four grades or more retarded in school is a perfect indication of a mentality not higher than normal, with the chances greatly in favor of its indicating at least a backward mentality. Two grades or more advanced in school are likewise a perfect indication of at least a normal mentality, with the chances greatly in favor of its indicating at least a bright diagnosis.

4. Wherever low indices are found, the most important reason for this is the tendency of the schools to retard children who are perfectly normal or slightly advanced mentally.

5. If this tendency is explained by lack of industry on the part of pupils who would presumably be promoted regularly with industry present, then a possible cause for the lack of zeal of these normal pupils is the increasing difficulty of passing the more advanced grades. This is a school tendency which is most prominent in the school of highest social status.

6. Whether increasing standards are desirable is a matter of school policy, to be determined by the educational aims recognized by the different schools. If the aim is the selection and fullest education of the better mentally endowed children rather than graduation of the largest possible number of pupils, then a high value for Q is undesirable.

THE EFFECTS OF SPECIAL DRILL IN ARITHMETIC AS MEASURED BY THE WOODY AND THE COURTIS ARITHMETIC TESTS

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Introduction.—Numerous and important factors are entering into the public school problem of today, which emphasize the need of efficient, time-saving, and systematic methods of drill work, so necessary in the formative period of our school youth. The question arises: Is a systematic form of drill work a saving over the regular school work, and is it just as much or more efficient?

Plan of the Test.—The following data, charts, and results in arithmetic are based upon the work of a 6A and a 6B grade in a Columbus City School. The work extended over a period of 43 school days from October 4, 1917 to January 29, 1918. The 6B group was used as the practice group and the 6A as the control group. The Courtis Test and the Woody Arithmetic Test A were used for control tests. The Studebaker Economy Practice Exercises* were used as the daily drill work in addition to the regular school work in arithmetic, except the time of the drill was deducted from the regular arithmetic work of the 6B class. The 6A class received no training in arithmetic except the regular school arithmetic. Both grades were tested with the Courtis, and Woody Arithmetic tests in October and again in January after the 43 periods of practice.

Personnel of the Class.—All the children from two rooms were selected for the experiment. Each room was in charge of the regular teacher and no attempt was made to make the slight change in the program due to the introduction of the drill as something special, in fact, no child knew that the work was not a part of the regular prescribed work for the semester. The 6B class was in charge of one of the writers. The children in the two rooms were quite similar in ability. The 6A class was one semester in advance of the 6B group. The median age of the children in the 6A group was 11.7 years, and 11.5 years for the 6B group. During the period of drill the main work for 6A grade was percentage with a general review of the fundamental processes. The work of the 6B grade was decimals. As one of the writers has had experience in teaching both grades she believes that both grades were average ability in their respective classes.

*STUDEBAKER, J. W. *Teachers' Manuals for the Studebaker Economy Practice Exercises in Arithmetic.* p. 2. (Sott, Foreman & Co., N. Y.)

Description of the Control Tests.—(A) The Courtis Standard Research Tests, Series B, Form 1, are a series of problems in addition, subtraction, multiplication, and division. The problems represent regular formal problems in the various processes and one problem in a list is about as difficult as any other problem in the same list. The emphasis is on speed and accuracy. Only a knowledge of the four fundamental processes is necessary in order to solve the problems. A time limit is set for each process. The score records the number of problems attempted and the number solved correctly. Thus the score made by the class can be compared with a previous score, or the form set up by Mr. Courtis.

(B) The Woody Arithmetic Scale was also used in the control series. This series consists of four scales, one for each of the four fundamental processes. Woody states that his "fundamental idea was to derive a series of scales which would indicate the difficulty of the problems that a class can solve correctly. Accordingly, each of the scales is composed of as great a variety of problems as the fundamental operations can well permit.[1] These problems, beginning with the easiest that can be found, gradually increase in difficulty until the last ones in each series are so difficult that only a relatively small percentage of the pupils of the eighth grade are able to solve them correctly.[2]

A time limit of 20 minutes was allowed for each process. This allows ample time for even the slowest pupil to solve all the problems which he is capable of solving. This method, while it places the emphasis on achievement and does not consider speed as an important factor in ability, is a good test of the regular class work, yet it must be remembered that the courses of study throughout the country are not uniform. In the Columbus Course of Study little emphasis is placed upon denominate numbers in the sixth grade. As a result these pupils were unable to solve problems of this type. The four tests contain 10 such problems.

Description of the Drill Work.—The Studebaker Economy Practice Exercises (SET B) include 50 different exercises and are to be used in grades four to eight inclusive. There are 16 exercises in addition, 7 in subtraction, 13 in multiplication, and 14 in division. The amount of material in the set is sufficient for a year's work, although some very bright children will complete all the exercises in a much

[1]Written problems are not included by Mr. Woody.

[2]WOODY, CLIFFORD. *Measurements of some Achievements in Arithmetic.* Columbia Contributions to Education, No. 80, 1916, p. 1.

shorter time. The examples have been carefully formulated according to the author, and the graded standards are based on the tests given to several thousand pupils.

As the child works through the exercises he will review in an orderly way all the possible combinations in the four fundamental processes. Increased skill is secured not by making the examples more difficult, but by requiring pupils in the higher grades to do the work in less time. For example, the fourth grade children of ordinary ability are expected to complete any one of the exercises successfully in 7 minutes, whereas the eighth grade pupils should do the same work in four minutes.

The following is Studebaker's Table of Standards:

Number of minutes for completion with 100% accuracy

Classes	Grade 4	5	6	7	8
Classes of ordinary ability	7	6	5	4½	4
Classes of exceptionally capable children	6½	5½	4½	4	3½
Classes of exceptionally slow children	7½	6½	5½	5	4½ *

The graphic representation of the difference in achievement in the two groups is shown in Plates II and III. This graph also gives a comparison of the achievement of the class in October with the achievement of January. The graphic representation of the norm of Courtis is also included in the graph for comparison purposes.

The Efficiency of the two Groups at the End of the Practice Period.— The degree to which teaching increases the efficiency of the class is very important. Mr. Courtis believes that the teaching efficiency of arithmetic as taught at present is about 5% in the United States. A not impossible ideal in such a subject as arithmetic would be 100%, but 80% would be a fair achievement if absolute accuracy is not to be the goal. For want of a better statement of representation of efficiency it will mean here the percentage of the class which reaches or exceeds the norm (median) for the group. For the sixth grade in addition it will mean the percentage of the class which solves 9 or more problems correctly in 8 minutes in the Courtis Arithmetic list.

*STUDEBAKER, J. W. *Teachers' Manuals for the Studebaker Economy Practice Exercises in Arithmetic.* p. 2. (Sott, Foreman & Co., N. Y.)

PLATE I.
THE STUDEBAKER ECONOMY EXERCISE

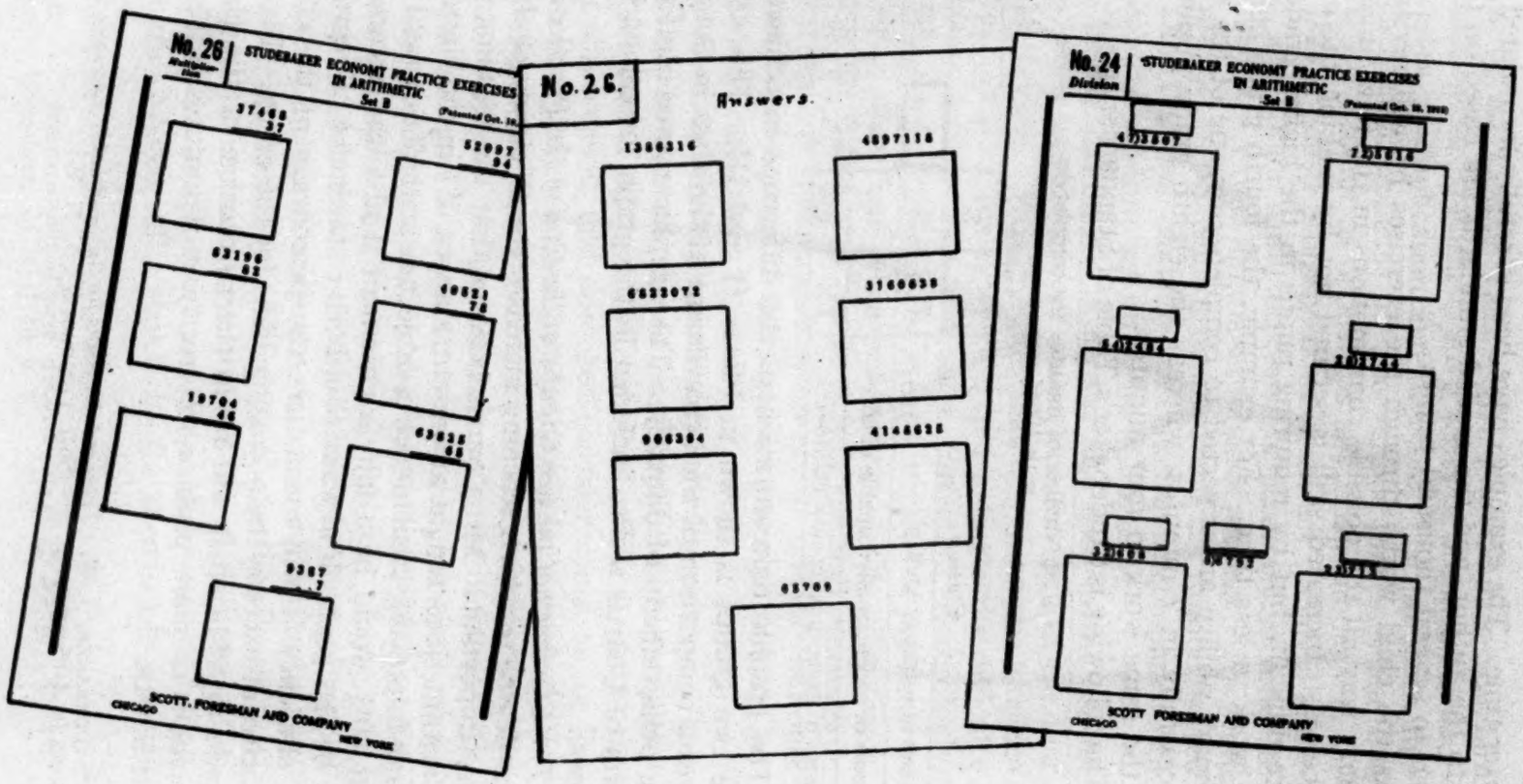


TABLE I.

Results of the Drill.—The percentage of gain from October to January by the Woody Arithmetic Test is shown in Table I.*

Process	Grade	Date			Boys Aver. Accu.	Girls Aver. Accu.	Total Aver. Accu.	Total Aver. Gain	Gain of 6B over 6A
Addition	6A	Oct. 8	1917		69.9%	67.7%	68.8%		
		Jan.28	1918		74.4	82.8	78.6		
				Gain	4.5	15.1		9.8%	
Addition	6B	Oct 8	1917		71.2	68.9	70.1		
		Jan. 28	1918		85.8	86.7	86.3		
				Gain	14.6	17.8		16.2	+6.4
Subtraction	6A	Oct. 8	1917		74.1	68.3	71.2		
		Jan.28	1918		72.5	72.7	72.6		
				Gain	-1.6	+4.4		1.4	
Subtraction	6B	Oct. 8	1917		72.2	63.9	68.1		
		Jan.28	1918		80.0	78.5	79.3		
				Gain	7.8	14.6		11.2	+9.8
Multiplication	6A	Oct. 8	1917		56.6	55.7	56.2		
		Jan.28	1918		72.2	71.0	71.6		
				Gain	15.6	15.3		15.5	
Multiplication	6B	Oct. 8	1917		58.3	58.8	58.6		
		Jan.28	1918		65.7	69.0	67.4		
				Gain	8.4	10.2		9.3	—6.2
Division	6A	Oct. 8	1917		60.5	61.1	60.8		
		Jan. 28	1918		70.2	72.7	71.5		
				Gain	9.7	11.6		10.07	
Division	6B	Oct. 8	1917		59.2	58.7	69.1		
		Jan.28	1918		79.0	72.0	75.5		
				Gain	19.8	13.3		16.5	+5.8

TABLE II.

A comparison of the achievement of the two groups with the Woody norm.

Process	Grade	Date		Class norm	Woody norm	Gain	
Addition	6B	Oct.	1917	7.72	7.95		
		Jan.	1918	8.59		.87	
	6A	Oct.		7.62	7.95		
		Jan.		7.91		.29	
Subtraction	6B	Oct.		6.27	6.46		
		Jan.		7.51		1.24	
	6A	Oct.		6.17	6.46		
		Jan.		7.31		1.14	
Multiplication	6B	Oct.		6.21	6.72		
		Jan.		6.82		.61	
	6A	Oct.		6.19	6.72		
		Jan.		6.98		.79	
Division	6B	Oct.		5.70	5.87		
		Jan.		6.56		.86	
	6A	Oct.		5.89	5.87		
		Jan.		6.55		.66	

*In Table I the percentage of accuracy is the percentage of problems solved correctly of all the problems attempted and not of the entire number in the list.

SUMMARY OF TABLE I. *

Process	Gain of 6B over 6A
Addition	6.4%
Subtraction	9.8
Multiplication	-6.2
Division	5.8
Average Gain	5.8

* In Table I the percentage of accuracy is the percentage of problems solved correctly of all the problems attempted and not of the entire number in the list.

TABLE III.

The percentage of gain from October to January as shown by the Courtis Arithmetic Test.

Process	Grade	Date		Boys	Girls	Aver.	Gain	Gain of 6B over 6A
Addition	6A	Jan.	1918	54.9+	60.8	57.9		
		Oct.	1917	51.8	52.5	52.2	5.7%	
	6B	Jan.	1918	74.5	81.6	78.1		
		Oct.	1917	69.1	52.1	60.6	17.5	11.8%
Subtraction	6A	Jan.	1918	73.8	64.4	69.1		
		Oct.	1917	80.8	69.5	75.2	-6.1	
	6B	Jan.	1918	98.1	86.7	92.4		
		Oct.	1917	76.7	71.0	74.4	18.1	24.1%
Multiplication	6A	Jan.	1918	55.2	68.2	61.7		
		Oct.	1917	57.4	56.0	56.7	5.0	
	6B	Jan.	1918	74.0	78.0	76.0		
		Oct.	1917	68.7	59.0	63.9	12.2	7.2%
Division	6A	Jan.	1918	65.2	71.2	68.2		
		Oct.	1917	64.2	63.7	64.0	4.3	
	6B	Jan.	1918	78.8	71.6	75.2		
		Oct.	1917	56.2	61.5	58.9	16.4	12.1%

SUMMARY OF TABLE III.

	6A	6B
Addition	5.7% gain	17.5% gain
Subtraction	-6.1	18.1
Multiplication	5.0	12.2
Division	4.3	16.4
Average Gain	2.2	16.1

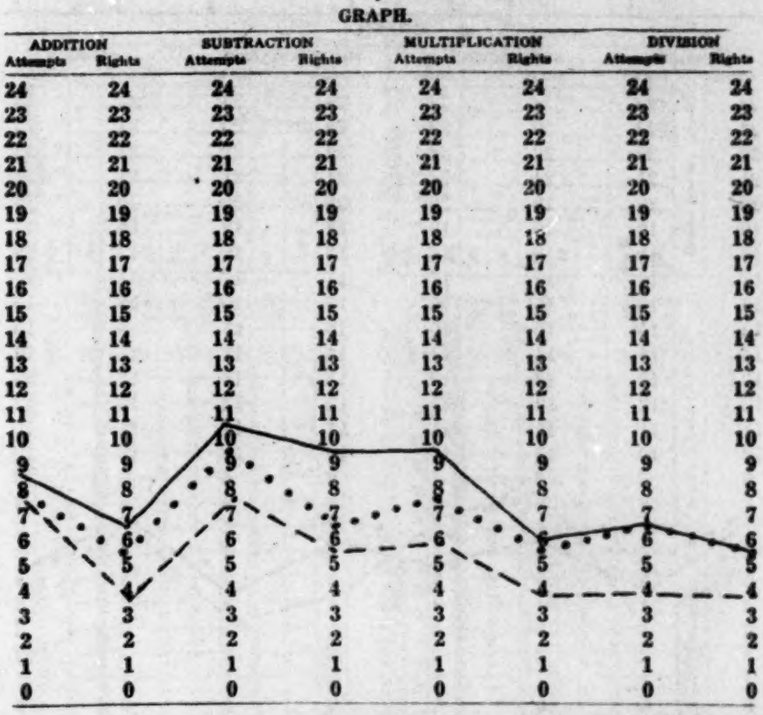
PLATE II.

Class Score

6B

Test	Subject	Attempts		Rights	
No. 1.	Addition	7.1	8.3	3.8	6.6
No. 2.	Subtraction	7.1	10.3	5.7	9 5
No. 3.	Multiplication	5.8	9.3	3.6	6.0
No. 4.	Division	3.8	6.5	3.5	5.3
		Oct.	Jan.	Oct.	Jan.

GRAPH.



The — — — — line indicates the graph of the school for October
The ———— line indicates the graph of the school for January
The . . . . . line indicates the standard graph by Courtis.

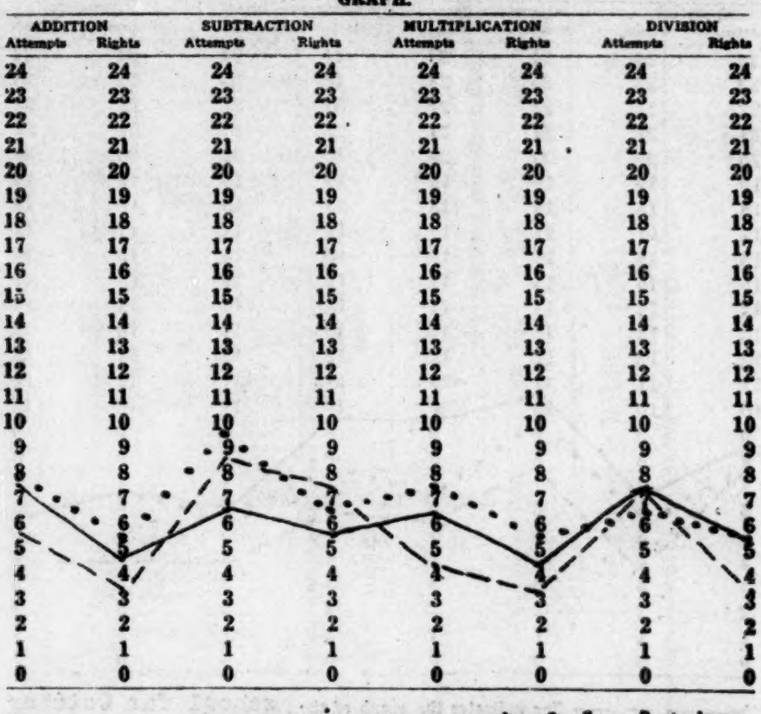
PLATE III.

Class Score

6A

Test.	Subject	Attempts		Rights	
No. 1.	Addition	5.6	7.1	3.2	4.6
No. 2.	Subtraction	8.9	6.9	7.6	5.8
No. 3.	Multiplicat'n	4.1	6.7	3.7	4.6
No. 4	Division	7.5	7.3	3.3	5.3
		Oct.	Jan	Oct	Jan

GRAPH.



The — — — — line indicates the graph of the school for October.
The ———— line indicates the graph of the school. for January
The . . . . . line indicates the standard graph by Courtis.

PLATE IV A.

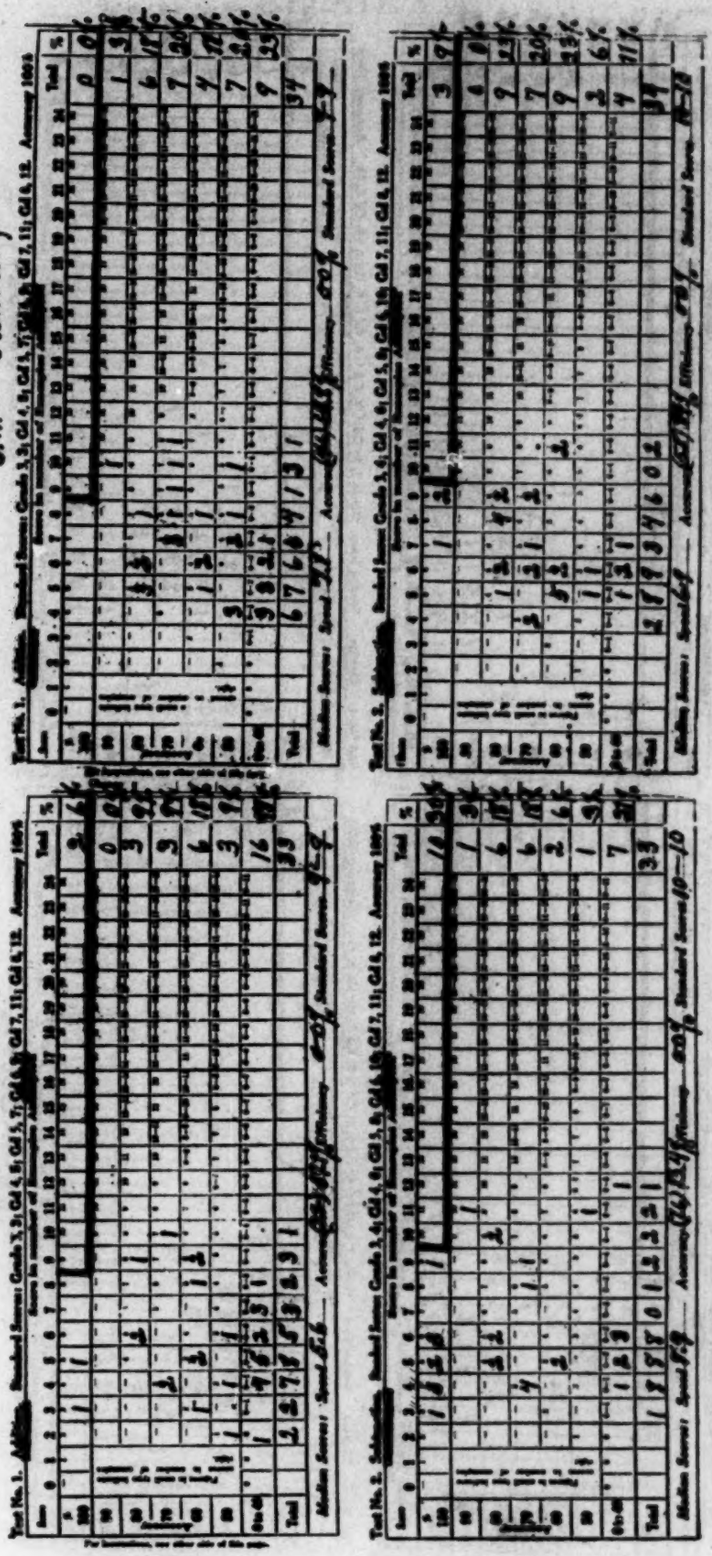


PLATE IV B.

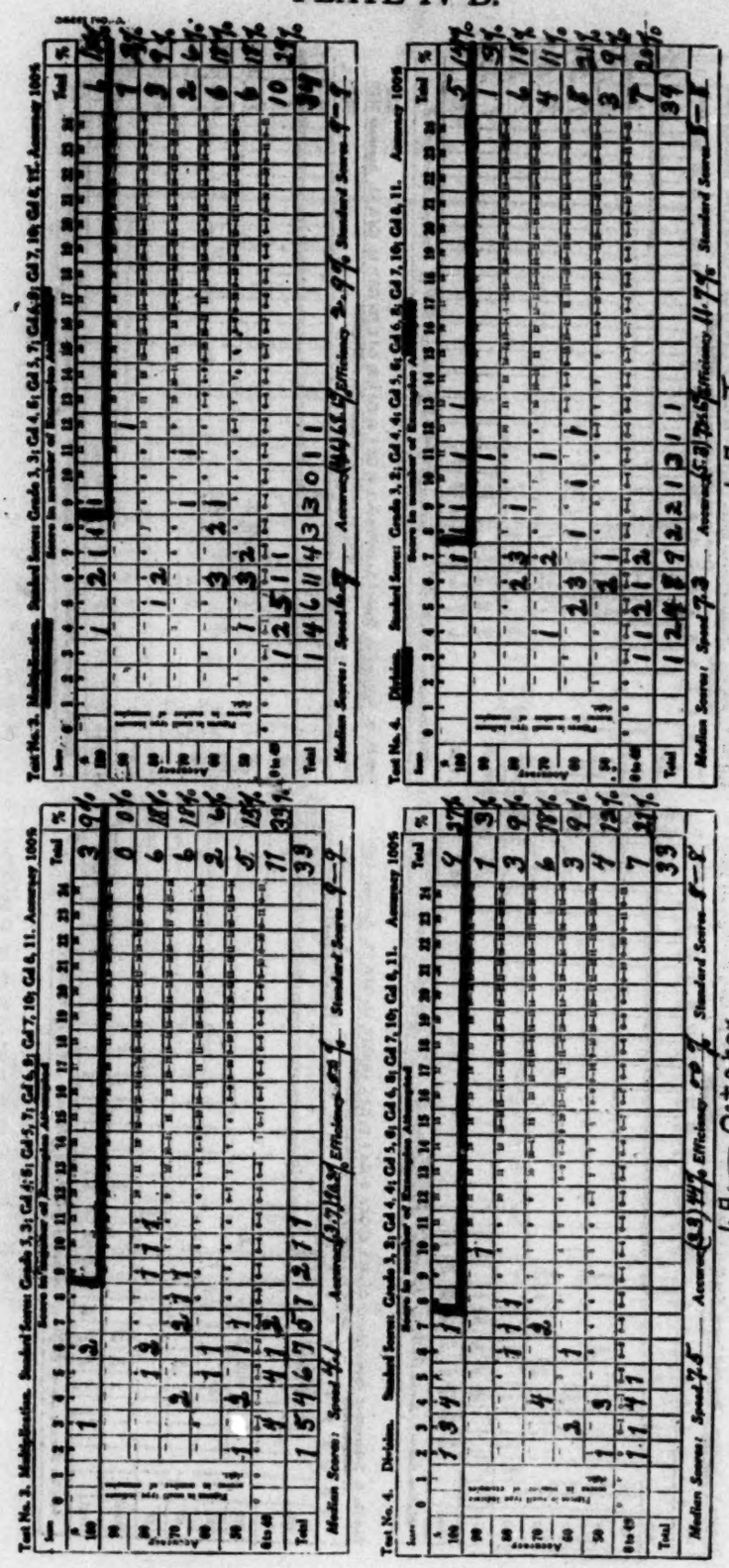
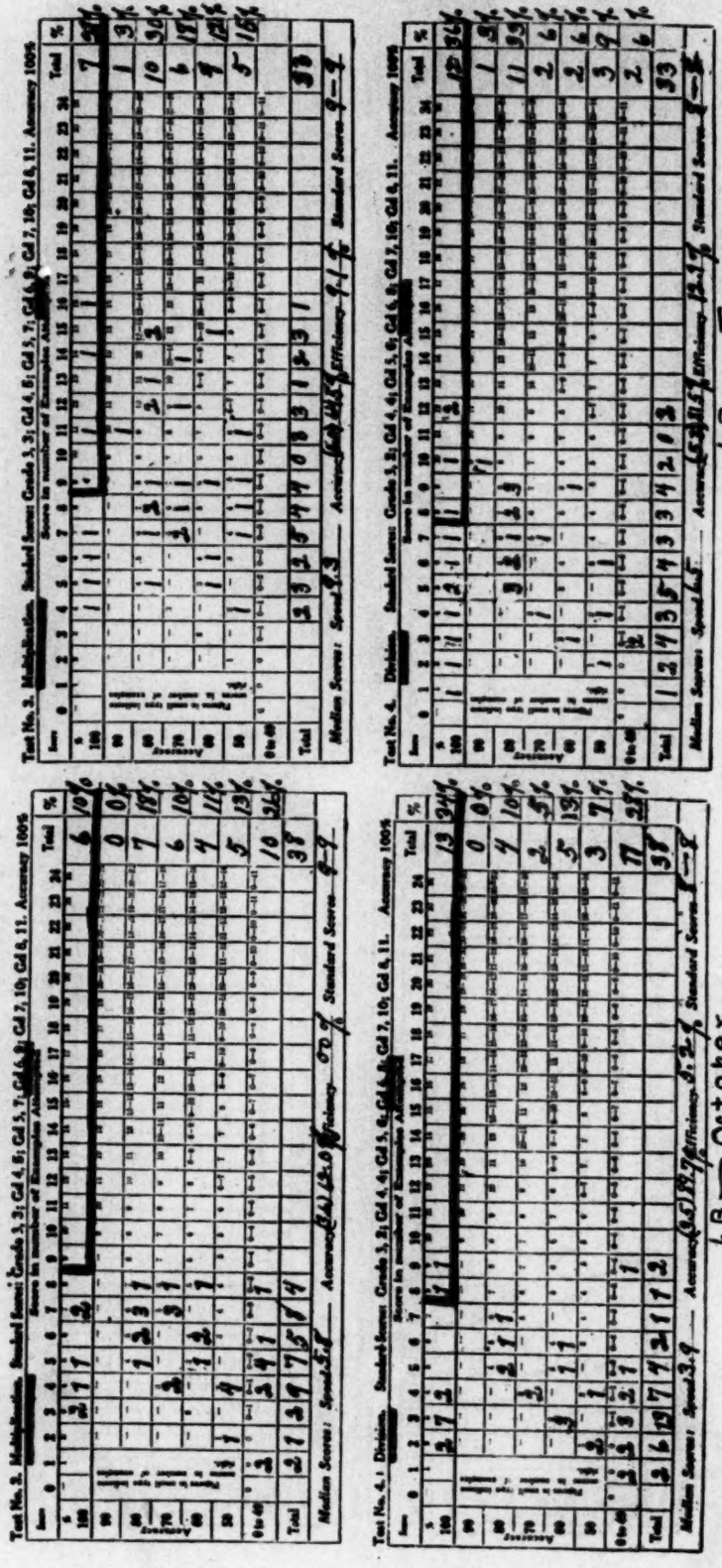


PLATE V A.

PLATE V B.



Tables III and IV show the efficiency and also the distribution of the two groups in October and in January. The percentage of the class which falls above and to the right of the heavy black line will represent the efficiency of the group. It is easy to note also that the distribution of the 6A group is about the same in January as in October, but the position of the 6B grade has changed completely.

It would be quite interesting to make such a comparison with the Woody scale but the type of norm used prevents individual comparisons with the norm. The achievement of the two groups may be compared, however, with the Woody norms. This comparison is shown in Table V. In every case except one (Multiplication) the 6B group made a greater gain than the 6A group. The teacher felt that even this one exception was due to the special emphasis which she had placed upon this process in the review work during the period of practice.

The Effect of Practice upon the Bright and the Dull Members of the Class.—A very valid question to ask concerning every mechanical device or drill of this nature is whether the poorest or slowest pupils of the class who really need the assistance most are really benefited as much as the faster and brighter members of the class. To answer this question the 6B group was divided into two parts according to the number of exercises which the members of the class solved or worked with 100% accuracy in the drill. The set contained 50 exercises but the greatest number solved in the 43 days was twenty-five. Those pupils who solved twenty-five exercises were termed the fast or bright group. The slow or dull pupils include those who solved eight exercises or less in the same time. The first group gained 17% in accuracy in addition in the Woody exercises, and 24% in the Courtis exercises. The slow group made a gain of 15% and 31% respectively in the same time. What is true of addition was also true of the other processes. It is interesting to note that in the two groups there was not a single case in which the individuals were not benefitted by the exercise or drill.

That the drill was as effective for the older members of the class as the younger members is shown in Plate V in the graphic representation for each individual for the four processes in the Courtis test both in the October and the January examination. The unshaded oblongs represent the achievement in October, and the

shaded oblongs the achievement in January. The ordinates show the number of problems solved correctly; the abscissa show the number of cases arranged in an increasing series according to the age of the individual as shown by the figures along the base. In some few cases the child was not present for both tests. In the sixth grade children of 13 or 14 years of age are apt to be retarded from some cause. A weak mentality is not the least among these causes. In this class some few cases may have been retarded because of low mentality, but in all these cases the drill was effective, nevertheless.

Conclusions.—Such drill exercises as the one here used have a great value in increasing the ability of a class in terms of accuracy far beyond the class exercises and drills now given in the public schools for the same purpose. This special exercise benefitted all members of the class regardless of whether they were slow or fast, dull or bright, very young or old, for the sixth grade. The average increase in efficiency due to 43 periods of practice of 5 minutes each (the maximum time used in preparation for the drill, and the drill, was 10 minutes) was 17.3% for the four processes. The increase in accuracy for the class with only the regular school work was 3.7%.

Both classes were below the Courtis and Woody norms in October. In January the class with the special drill had reached the norm for division in the Courtis and had surpassed the norms in both scales in the other cases. The class without the drill was still below the Courtis norm in all except division, and below in addition in the Woody scale.

As a convenient, effective and time-saving method of gaining speed and accuracy in the fundamental processes in contrast to the regular work of the school the drill is quite effective. The drill seems to be the most effective for the type of mathematical ability measured by the Courtis test rather than the ability which the Woody scales measure, although all the pupils made gains in this direction as well.

WORK CURVES

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Meumann, Kraepelin and others claim that there are different types of work-curves in computation experiments. Meumann claims that there are three types of workers as indicated by their curves. One of these obtains maximal efficiency at the start and decreases with many fluctuations; the second obtains maximal efficiency only after an interval of great length. The first is characterized by quick adaptation and early fatigue; the second by slower adaptation and slower fatigue; and, the third, by very slow adaptation and high resistance to fatigue.*

Offner speaks of a fourth type, the "concave type of curves." He says then: "It is possible to regard the peculiarities in the general shape of the work-curve as due simply to individual differences in type of fatigue; in that case, the curves would be really curves of fatigue." †

The writer in his discussion of individual curves ‡ calls attention to the fact that in the data examined, there are various kinds of curves. Such differences may be due to slight intercurrent causes, and are not, in the lack of further evidence, to be regarded as indicative of different types of workers. And since the data offered peculiar opportunity to show whether or not there are such things as types in computation or addition work-curves, the material of the above mentioned experiment has been made use of for that purpose and the results are given in the following pages.

DESCRIPTION OF MATERIAL TO BE HANDLED

The material to be handled is data obtained in a continuous work experiment in which three hundred sixty-eight third and fourth grade, and three hundred forty-three seventh and eighth grade children of the Virginia public schools, — Richmond, Petersburg, and Farmville used the Thorndike addition sheets. The purpose of the original experiment was to find out how much school children

*G. M. WHIPPLE. *Manual of Mental and Physical Tests.* p. 335.

† M. OFFNER. *Mental Fatigue.* pp. 75-76.

‡ T. R. GARTH. *Mental Fatigue During Continuous Exercise of a Single Function.* p. 26. Archives of Psychology, Vol. XXVI, No. 2 Columbia University Contributions to Philosophy and Psychology.

fatigue while engaged in doing addition during a rather extended length of time. The addition sheets were arranged in pads securely fastened together. Before the experiment was begun these pads were passed out to the pupils face downward and each child was instructed to write his name, school, grade, the date and hour, and his age and sex on the blank side. The explanation was made to the pupils that the experimenter wished to find out who was the best "adder" in the class and it was insisted that each should do his best. In addition they were told that they would spend two minutes on a single sheet as timed by the experimenter's stop watch. They were to have the signal "Go!" for starting together on a sheet, and "Stop!" for a signal that the two minutes were up. No time was lost in passing to the next sheet for the experimenter said immediately, "Take the next sheet. Go!" This procedure continued until all the sheets in the pad were used up.

When the sheets were taken up and gone over the experimenter was able to know just how much was done by each child every two minutes.

Many of them did better at the start than they did toward the finish, as one would naturally suppose, but some did better at the close of the working time than they did in the beginning. However there was more of a tendency toward falling away in accurate work at the end than there was in the merely attempted work. That is to say that a pupil undertook more problems than he did correctly.

The group performances were plotted into curves whose points were determined by the average performance of the group at each two minutes and the study of these curves show a falling away at the end when it is taken in comparison with the beginning of the curve. The maximum of accurate performance as indicated by the curves is reached earlier in the course of the work than in the attempted performance.

Space is lacking here to describe the experiment more fully, but the outcome of the experiment, speaking briefly, was that the younger group experienced a greater falling off in both work attempted and in accurate work that the older group. Other conclusions besides were drawn, such as that the slow workers tended to fatigue sooner than the better workers, but these observations are not necessary to the discussion here in hand and they are only given to afford the reader some idea of the nature of the original experiment.

The younger group added for twenty-eight minutes and the older group for forty-two minutes. The records show what was attempted and what was accurately done by each subject for each two minutes of the time. We call these two-minute divisions of the total time, *periods*, making fourteen periods for the younger group and twenty-one periods for the older group.

In this way, we get three hundred sixty-eight curves of work attempted, and three hundred sixty-eight curves of accurate performance in the lower grades; and in the higher grades we get three hundred forty-three curves of attempted and three hundred forty-three curves of accurate performance. The total amount attempted and accurately performed by each child we now ascertained for every single curve. Because it was felt in making a group curve of the absolute data, as above described, that the poorer workers were placed at a disadvantage and that their individual curves of work did not obtain a fair representation; in addition to the absolute curves, another kind of curve for each rubric (attempts and accurates), for each group, was made. This curve is called the average of the individual curves. To obtain the curve, the curve of each child was expressed in per cents of the total performance and, consequently, each step in the curve shows what part of his total work was done by him at that period of the total time allotted by the experiment. This seemed to give a more adequate expression of the work of the group than a curve expressed in absolute measures, or columns of addition. This average of the individual curves is somewhat different from the absolute curves.*

The curves just mentioned, composed of the per cent. of total performance done in each period, are the material upon which we wish to base these observations and conclusions as to types of work-curves.

The question as to whether there are types of work-curves in the same sort of work, as in addition of one place figures, may be answered by the generalization that there are no such things as many types in measurements of any one kind of human process or trait, and that there is only one type. This is a brief statement of the "Single-Type Theory." The alternative to this would be the "Multiple-Type Theory." If the Single-Type Theory is true, then there are no such things as types of work-curves, and Meumann and Kraepelin are wrong.

*A discussion of this may be found on pages 9-14 of the writer's dissertation, *Mental Fatigue During the Continuous Exercise of a Single Function.* Archives of Psychology, Columbia University.

In order to let these data contribute their experimental light on the subject, we have arrayed them in a way which should make of them a more or less positive argument for the support of the Single-Type Theory.

Work- Curves

Let us consider that we have all the individual curves arrayed before us. It is true, that some of the workers do rather well at the start and rather poorly at the end, some somewhat poorly at the start and somewhat better at the end, and others do their best work in the middle of the total time allotment. These curves may be found scattered all along, in going from the poorest performances on up to the best ones. But it would be another thing to call these types. We can prove this one way or the other, only by placing the data of the materials for the different periods or groups of periods in distribution curves to see if they are unimodal or not. If there are three types of work-curves, we should have three modes. If there is only one mode or central tendency of the facts, then there is only one type of work-curve.

Methods Used

As suggested above, we may examine the distribution belonging to the averages, which go to make up the curve representing the so-called average of the individual curves at any point along the self-same curve. Or better, to avoid chance errors, we may take into consideration how much was done during the first three periods by each individual and arrange these facts in a distribution curve. If there were three types, two would be evident at the start, and we should have then a bimodal distribution there. In order to further test the data for types, we could take the sum of what was done in the first seven periods, or half the total time of working in the younger group, and in the first eleven periods by the older children, and making distributions of these. Multiple modes ought to be evident here, two at least, if there are types of work-curves. Again, we could distribute the sums of what was done in the last three periods. If there are multiple types of work-curves, it should be evident here by bi-modality at least.

We give herewith the curves representing the distribution of these facts, those of the third and fourth grades first, followed by those of the seventh and eighth grades.

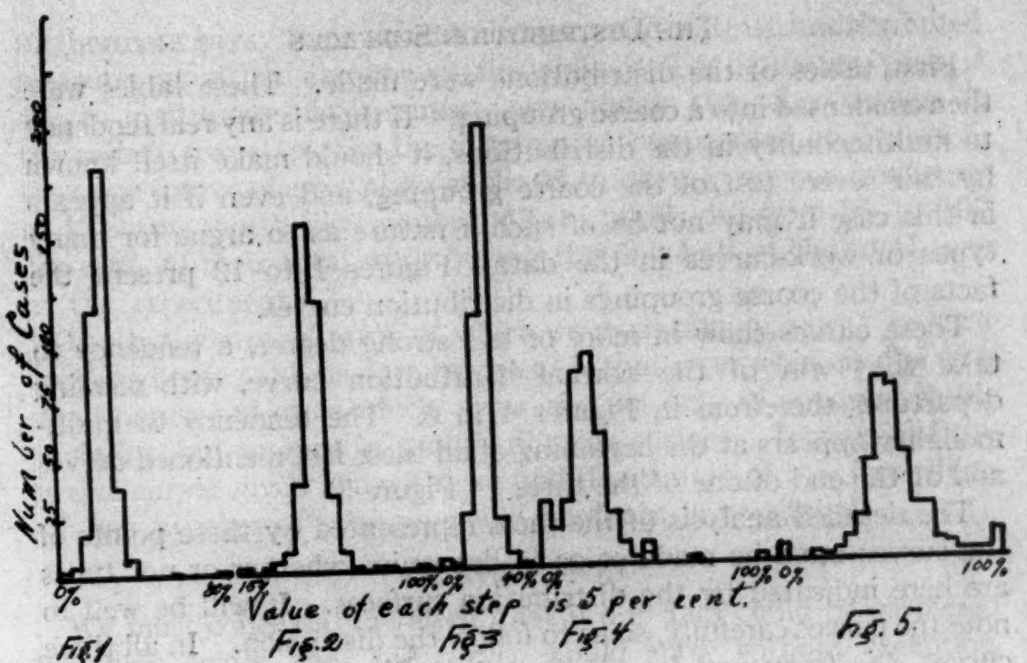

Fig. 1 Fig. 2 Fig. 3 Fig. 4 Fig. 5.

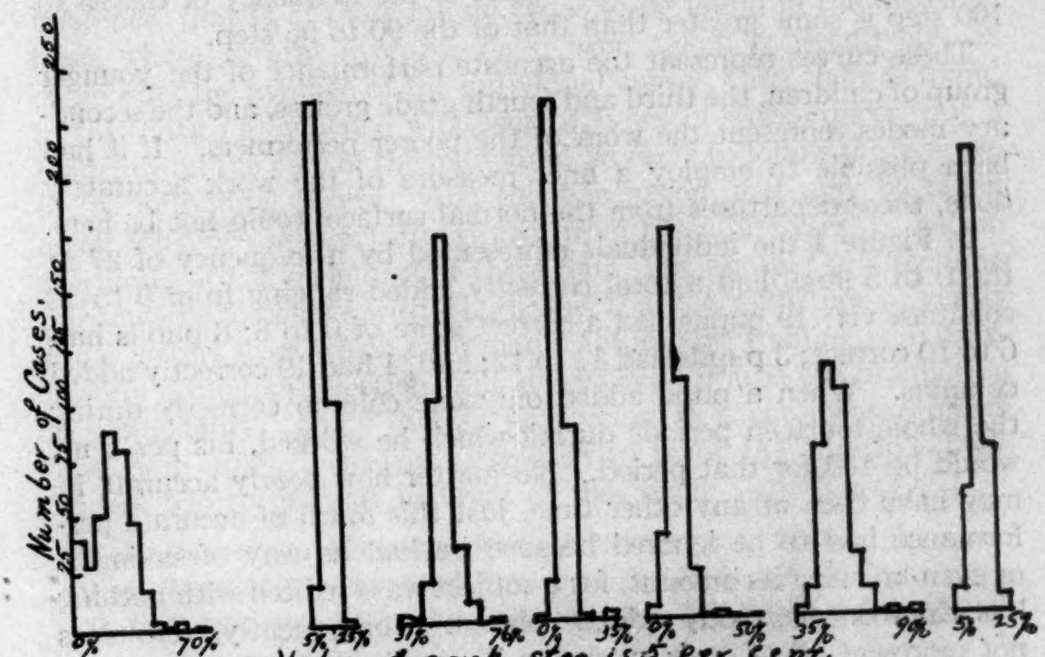

Fig. 6 Fig. 7 Fig. 8 Fig. 9 Fig. 10 Fig. 11 Fig. 12.

The Distribution Surfaces

First, tables of the distributions were made. These tables were then condensed into a coarse grouping. If there is any real tendency to multimodality in the distributions, it should make itself known by this severe test of the coarse grouping, and even if it appears in this case it may not be of such a nature as to argue for many types of work-curves in the data. Figures 1 to 12 present the facts of the coarse groupings in distribution curves.

These curves show in more or less strong degree, a tendency to take the form of the normal distribution curve, with seeming departures therefrom in Figures 4 to 6. The tendency to multimodality appears at the beginning of all these last mentioned curves and at the end of one of the three — Figure 5.

The detailed analysis of the facts represented by these points of the curves must be made so as to determine whether or not types are here indicated by the distribution surfaces. It will be well to note the curves carefully, so as to follow the discussion. In all these curves, the frequency for the 0 to 5 step stands somewhat above that of the 5 to 10 step. In Figure 5, the frequency of the 95 to 100 step is some greater than that of the 90 to 95 step.

These curves represent the accurate performance of the younger group of children, the third and fourth grade groups, and the secondary modes represent the work of the poorer performers. If it had been possible to employ a finer measure of the work accurately done, these departures from the normal surface would not be here.

In Figure 4 the individuals represented by a frequency of 27 at the 0 to 5 step, had a total correctly added ranging from 0 to 12 columns, viz: 19 pupils had a correct score of 0 to 6; 8 pupils had 6 to 10 correct; 3 pupils had 11 to 12; and, 1 had 19 correctly added columns. When a pupil added only one column correctly during the whole fourteen periods during which he worked, his per cent. would be 100 for that period. No matter how nearly accurate he may have been at any other time, just this much of accurate performance had to be ignored because we had no way of saving it or even knowing its amount, for a subject was credited with nothing less than one correctly added column. Consequently, zero does not represent all of one's work; as Thorndike says, the zero point does not always represent absolute zero but is often an indefinite point on the scale. In a situation such as the one here in hand, we have what he calls an "undistributed or indefinite" measure. He

furthermore says, "One should always guard against undistributed measures at either extreme of the scale."* The situation then is due to inadequate measurement, here and in the other curves, at the zero to five step. In the distribution represented by Figure 5, the same source of error plays at the 95 to 100 step when a frequency of 12 shows that a like number (12) of pupils did from 95 to 100 per cent. of their total work during the first-half of the total time of the experiment.

Another source of error of which we must take account† in such measurements as these data represent is that error which is due to a small number of cases which gives rise not only to apparent mutimodality, but to gaps in the distribution surface. In many of the twelve curves given herewith, we find illustration of this fact which a larger number of subjects would no doubt have altered.

CONCLUSION

We must conclude, therefore, that if our data could be corrected for these errors, that the curves would show without exception, conformity to the normal distribution curve. If we accept this inference, that is, if there are no types to be found in the distributions whose several averages have been taken consecutively, as composing the average of the individual curves, then there is found in this data no evidence whatever of types of work-curves, but a tendency on the part of the individual workers to follow the average of the individual curves. And this conclusion, if it may be taken as an inference satisfactorily drawn from these premises, is, within the limits of the meanings of these data, but another argument to pursuade us to believe with Thorndike, that "A multitude of nearly equal factors from which each man's nature and training is approximately a random selection, will always act towards the production of unimodality" and "that in proportion as exact measurements have been applied, evidence expected to favor the Multiple-Type Theory has turned out in favor of the Single-Type Theory."‡

‡E. L. THORNDIKE. *Mental and Social Measurements.* p. 22.

†E. L. THORNDIKE. *Educational Psychology, Vol. III.* p. 34.

‡E. L. THORNDIKE. *Educational Psychology, Vol. III,* p. 345 and p. 379.

STANDARDIZED ILLUSTRATIVE SENTENCES FOR THE SPRINGFIELD SPELLING LIST

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In the administration of standard tests in spelling where words are dictated, it is customary for the examiner or teacher to illustrate the meaning of a given word immediately after uttering it. It seems obvious that the response of the child will be affected in minor or major degree by the character of illustrative sentence used by the teacher. Ordinarily, a simple and felicitous sentence will be used, but on the contrary, there are occasions where the extemporized sentence obscures or delays the reaction of a child or class attempting a correct spelling. To what extent the variety of sentences, chosen extemporaneously by scores or hundreds of teachers during measurements of achievement in spelling, affects results, actually is not known. *E. g.,* In the report of the Butte survey (page 152) we are told that after the words were pronounced "and any explanations given by the teacher for their proper understanding by the children, the papers were collected," etc. (5) It is possible of course, that the failure to make uniform all sentences used illustratively with uniform tests in spelling is not a very serious defect in contemporary studies.

However, in the administration of a well-known list of words to about 25,000 children in 78 schools, the writer in advance wrote all illustrative sentences, and these were used by all examiners on the day of the test. The procedure was thus: The examiner pronounced the word, then spoke the illustrative sentence, whereupon the children wrote the word only. The list of words referred to is the Springfield, Illinois, test, devised by Leonard P. Ayres. (2) This list of words with the modifications referred to below was used as the basis of published reports on measurements of achievement in spelling by the school children of Butte, Montana; Oakland, California; Salt Lake City (4); Des Moines, Iowa, (1) etc.

More than one request has come to the writer for the list of uniform, illustrative sentences referred to above. The sentences are "standard" in the sense that we now have the results of their use as an aid during the administration of the Springfield List to large groups of children, classified as boys and girls, white and colored, and by grades. The data were obtained during the course of the

series of studies made by the writer in New Orleans during the spring of 1916. Although the results were given extensive local publicity it is believed to be worth while to present herewith for wider reading both (a) the illustrative sentences with the Springfield List, and also (b) the compiled results which afford the basis of tentative standardization. These results were tabulated by a group of paid and trained assistants who marked, and then checked all papers, and made the arithmetical calculations under close supervision. Schoolmen, it is hoped, may find the words and the sentences a convenient instrument for further measurements in spelling.

The tables of results are unusual in that the performances of two large groups of white and of colored children, taught in separate buildings, are contrasted. We do not know of the existence of a similar array of data obtained and analyzed with such care. Our impression, however, is that these data throw very little light upon the factors of race as affecting school achievements. The accompanying economic conditions, systems of instruction prevailing, physical equipment, etc., for the two races, white and negro, were markedly different. These are the condensed results classified by race:

TABLE I

Children Making Different Scores

The scores	100	90	80	70	60	50	40	30	20	10	0
The percentages of 17,642 white children	20	21	18	13	10	7	5	3	2	1	0.4
The percentages of 3,677 negro children	18	18	17	13	12	7	5	4	3	1	1

Here follow, first 60 words of the Ayres Springfield list with the illustrative sentences used by us, and then Table II containing the results by grade, sex, and race:

SPELLING SCALE USED IN SPRINGFIELD AND IN NEW ORLEANS WITH UNIFORM ILLUSTRATIVE SENTENCES (Ayres–Hill)

Grade 3.

FILL	Let us fill the pail with sand.
POINT	I can point to the North Star.
STATE	What state do you live in?
READY	We were ready just in time.
ALMOST	They almost missed their car.
HIGH	The kite flies high in the wind.
EVENT	We read of a very strange event.
DONE	The work was very well done.
PASS	The train will pass through the tunnel at night.
TUESDAY	We shall go skating on Tuesday.

Grade 4.

FORTY	There were forty boys in the race.
RATE	The boat goes at a rapid rate.
CHILDREN	Today the children will have great fun.
PRISON	The prison is so dark and gloomy.
TITLE	The story has a funny title.
GETTING	We are getting our boat ready to sail.
NEED	Fred will need more string for his top.
THROW	You watch when I throw the ball.
FEEL	Do you feel well, Tom?
SPEAK	Let us speak to the little boy.

Grade 5.

SEVERAL	We shall use several yards of ribbon.
LEAVING	They will be leaving for home tomorrow.
PUBLISH	Why not publish this story in the school papers?
O'CLOCK	Our boat will sail at six o'clock tonight.
RUNNING	Trout love to swim in running water.
KNOWN	The story of Joe's trip was not known that day.
SECURE	We shall secure an Indian guide to lead us.
WAIT	Time and tide wait for no man.
MANNER	She speaks in such an odd manner.
FLIGHT	They quickly put the enemy to flight.

Grade 6.

DECIDE	Let us decide it at once.
GENERAL	I am sure it will help us in general.
MANNER	He did it in such an odd manner.
TOO	We must not hurry too fast.
AUTOMOBILE	We shall have an automobile ride today.
VICTIM	He fell a victim to the enemy.
HOSPITAL	We sent flowers to the sick child at the hospital.
NEITHER	You must neither look nor listen till I call.
TOWARD	The sun is moving toward the horizon.
BUSINSSS	He did not like that kind of business.

Grade 7.

DISTRICT	They may move to another district.
CONSIDERATION	He gave the matter very little consideration.
ATHLETIC	He has a fine athletic form.
DISTINGUISH	He can easily distinguish red from blue.
EVIDENCE	He gave good evidence of being honest.
CONFERENCE	We must attend the conference this evening.
AMENDMENT	The amendment received a large vote.
LIQUOR	They voted against the sale of liquor.
EXPERIENCE	We had a jolly experience on the trip.
RECEIVE	We shall receive the message by wireless.

Grade 8.

PETRIFIED	We found some petrified wood.
TARIFF	The tariff bill has passed in the senate.
EMERGENCY	In an emergency I might be able to do it.
CORPORATION	The business is run by a large corporation.
CONVENIENCE	The automobile is a great convenience.
RECEIPT	We are in receipt of a note from James.
CORDIALLY	She treated her little friend very cordially.
DISCUSSION	The question raised a long discussion.
APPRECIATE	We always appreciate polite conduct.
DECISION	He made a very wise decision.

TABLE II

RESULTS OF USE OF SPRINGFIELD LIST WITH UNIFORM SENTENCES

White

	—Boys—		—Girls—		—Pupils—	
Grades	No.	Pct.	No.	Pct.	No.	Pct.
8B	325	69.3	613	72.6	938	71.5
8A	257	77.5	432	78.2	689	77.9
8	582	72.9	1,045	74.9	1,627	74.2
7B	502	74.4	727	78.4	1,229	76.8
7A	343	78.6	500	78.9	843	78.7
7	845	76.1	1,227	78.6	2,072	77.6
6B	718	74.0	900	78.2	1,618	76.4
6A	517	79.5	668	85.7	1,185	82.9
6	1,235	76.3	1,568	81.4	2,803	79.2
5B	940	74.9	1,005	77.8	1,945	76.4
5A	710	81.1	779	85.9	1,489	83.6
5	1,650	77.5	1,784	81.3	3,434	79.5
4B	1,114	69.8	1,072	76.1	2,186	73.0
4A	868	78.4	832	82.7	1,700	80.5
4	1,982	73.6	1,904	79.0	3,886	76.3
3B	1,057	56.6	1,043	62.0	2,100	59.3
3A	895	69.9	825	75.1	1,720	72.4
3	1,952	62.7	1,868	67.8	3,820	65.2
Total Pupils	8246	.....	9396	.....	17, 642	.....
Ave. Percentages		72.4		77.1		74.9

Colored

	—Boys—		—Girls—		—Pupils—	
Grades	No.	Pct.	No.	Pct.	No.	Pct.
8B	42	61.7	71	65.1	113	63.8
8A	18	70.0	40	75.5	58	73.8
8	60	64.2	111	68.8	171	67.2
7B	52	58.7	88	64.9	140	62.6
7A	17	70.6	45	69.1	62	69.5
7	69	61.6	133	66.3	202	64.7
6B	84	74.4	165	77.3	249	76.3
6A	52	83.3	102	83.0	154	83.1
6	136	77.8	267	79.4	403	78.9
5B	154	75.1	245	80.4	399	78.3
5A	76	83.0	133	84.2	209	83.8
5	230	77.7	378	81.7	608	80.2
4B	215	70.0	346	77.4	561	74.6
4A	201	73.5	238	82.0	439	78.1
4	416	71.7	584	79.3	1,000	76.1
3B	296	54.9	420	60.5	716	58.2
3A	261	68.7	316	74.9	577	72.1
3	557	61.2	736	66.6	1,293	64.4
Total Pupils	1,468		2,209		3,677	
Average Percentages		68.5		74.2		71.9

It is known, of course, and we are so cautioned by Ayres, that any list of words to be used for measuring certain attainments in school will become unreliable when children become accustomed to spelling the particular words of the scale. Investigators who may use the Ayres List will note, also, that our comparisons of this Springfield list of 70 words, contrasted with the list of 70 words actually used in the Butte, (5) Salt Lake City, (4) and Des Moines (1) studies, reveal slight variations from the original Springfield List, a matter not noted in the reports of any one of the three investigations mentioned above. *e. g.*, (1) Compare substitution of *organization* for *petrified* in Butte, (5) Des Moines (1), and Salt Lake City (4) studies; also *appreciation* for *appreciate* in Des Moines study. Furthermore, nine words in the Springfield List of 70 words (2) are not contained in the final list of one thousand words published in chart form (3) by the Sage Foundation. (*i. e.*, title, hospital amendment, liquor, petrified, corporation, convenient, tariff, leaving.) We are unable to explain the first irregularity, but a letter from Acting Director Richardson of the Sage Foundation stated in explanation with regard to the second "that the 70 words which you used were contained in the original list of 1,000 common words selected by Dr. Ayres, the words which appear in the original list were not all included in the thousand which were finally selected."

Rigid comparisons of the results of the Springfield, Butte, Salt Lake City, Des Moines results in spelling with the results obtained from lists drawn from Ayres' published chart (3) of the "1000 words most commonly used in writing" are obviously questionable. The usual assumption in giving the Springfield List, whether in its original or in the modified forms, is that these particular words were on the average spelled correctly by 70 per cent. of the children tested in about 100 cities. The lessons indicated are that we can not assume the identity of various lists of words originating in the Springfield List with words drawn from the Ayres published scale of 1,000 words, and that there is considerable room for improvement in the direction of standardizing a procedure for the actual administration of standard spelling scales.

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(4) E. P. CUBBERLY and others. *School Organization and Administration. A Concrete Study Based on the Salt Lake City School Survey.* N. Y. 1917, 346 pp. See pp. 132-140.

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EDITORIAL

THE DYNAMICS OF MOTIVATION

Whatever of good or of evil the doctrine of interest and its advocates may have brought into American education, it is chiefly responsible for the present vogue of the term motivation. We hear much of motivated study, of the motivation of each step of the recitation, of the necessity for motivation in school conduct, and of the importance of motivation in all phases of education. This emphasis on motivation has the advantage of forcing the attention of the teacher from the text book ,the course of study or the class lesson plans to the learning process itself and to the attitude of the pupil toward school tasks. A fatal error of the old disciplinary education was the neglect of this matter of attitude or rather the assumption that the learning attitude could be elicited at command. So long as education was regarded as the privilege of the select few the evils of this assumption were ignored, but with the advent of the conception of universal education, and especially with the effort to make universal education compulsory, the need for a more careful consideration of the mainsprings of learning became evident.

Much of the current discussion of motivation in education is either superficial or mystical. What constitutes a motive, how are motives related to each other, how can motives be developed and utilized in educational procedure are questions that cannot be readily answered. An adequate psychology of motivation is yet to be written. One of the most stimulating contributions to the subject is to be found in Woodworth's recent book *Dynamic Psychology*. All explanations of conduct must be based upon the sensory-motor arc and its modifications. The action of the sensory-motor arc, even in its most highly complicated forms, is strictly mechanistic, but just as all mechanisms of which we have any knowledge require some application of force to actuate them, so the neural mechanism controlling behavior must have some impetus to set it going. Thus we have the fundamental distinction between "mechanism" and "drive." In the simple reflex arc the "drive" is furnished by the sensory stimulation. In the more complicated arcs involved in reflective behavior "drives" reinforce or inhibit each other, and undergo modification through memory and habit formation. Every "mechanism" must be affected by some sort of "drive" to produce a reaction, but any mechanism may act as a "drive" to bring about a reaction of any other "mechanism." Thus many "drives" result only in preparatory reactions, and the final, consummatory reaction, which is manifested in overt behavior, is the end station of an elaborate complex of initiatory "mechanisms" with their appropriate "drives."

The conception of "drive" lends itself admirably to the discussion of the emotional aspects of consciousness and their significance for thought and action. It is emotional attitude that is of the greatest importance in learning, and that needs much more careful consideration at the hands of educational psychologists. Educators need to study the "drives" of individual pupils, not so much to cater to their whims, as to build up those emotional complexes, those likes, desires, aspirations, that will constitute a motive power for the effort required in school learning. Recent studies in retardation and elimination point to the very great importance of the pupil's attitude toward his studies for his success in school, and it needs only casual conversations with pupils to discover the intensity of their likes and dislikes for different school subjects. Part of this attitude doubtless depends upon native endowment, and is little subject to modification, but the possibility of combining and developing "drives" in pupils suggests the results that might be attained by fostering a zest for learning.

J. C. B.

NOTES AND NEWS

In January of this year the Alpha Army Tests were given to about 3475 students of the University of Illinois. The medians for the different classes ranged from 121 to 163 (highest possible score 212). The highest score made was 207. According to the army ratings 105-134 was called B (Superior), and 135-212, A (Very superior). The vast majority of the officers tested made A and B ratings. The greater number of college students also made A and B ratings, very few having a score below 100. The women consistently made lower median scores than the men. The committee in charge of the application of the tests was David S. Hill (Chairman), B. R. Buckingham, C. A. Ruckmich and C. E. Holley.

The Otis Group Tests of Intelligence have now been made available in neat booklet form by the World Book Company, Yonkers, N. Y. The publishers state that the first printing of the tests was exhausted within a few weeks, and a much larger printing was called for than had been anticipated. It is to be hoped that Dr. Otis may be able to standardize the scores for the upper elementary and high school grades during the coming winter.

In view of the widespread professional interest in the reports constituting the Gary School Survey the General Education Board, 61 Broadway, New York City, announces that any volume will be sent free of charge on application. The list of reports is as follows: *The Gary Schools. A General Account*, Abraham Flexner and Frank P. Bachman; *Costs*, Frank P. Bachman and Ralph Bowman; *Industrial Work*, Charles R. Richards; *Household Arts*, Eva W. White; *Physical Training and Play*, Lee R. Hammer; *Science Teaching*, Otis W. Caldwell; and *Measurement of Classroom Products*, Stuart A. Courtis. The Board also announces for immediate publication and free distribution on request *Public Education and Private Endowment*, and *Public Education in Delaware*.

For the first time in the history of Harvard University properly qualified candidates for the Master's degree may present programs consisting of summer school courses only. This will be of obvious advantage to teachers who desire to become candidates for the advanced degree without giving up their regular positions. The Harvard School of Education has just announced a gift of $500,000 from the General Education Board, on condition that a sum of $1,500,000 be raised from other sources for the endowment of a Graduate School of Education.

The April meeting of the New York Society for the Experimental Study of Education dealt with "Problems Connected with the Junior High School." The program was as follows: "Problems in the Organization of the Junior High School," Professor Thomas H. Briggs; "The Relation of the Junior High School to the Senior High School," Dr. Joseph K. Van Denburg; "Practical Problems

in the Work of the Junior High School," Principal Robert B. Brodie. The May meeting was devoted to reports of the chairmen of committees on the projects contemplated for investigation next year.

The New York Branch of the American Psychological Association held its last meeting for the school year on May 5. The following papers were presented. "Experimental Test of the Newer Philosophy of Education," Dr. William A. McCall; "Correlation between Aesthetic and Recognition Value," Dr. Annie Berliner; "The Agreement between Judgments of Letters of Recommendation, Photographs, and Handwriting, and Judgments of the Success Achieved in the Educational Field," Miss Laura M. Chassell.

The Carnegie Institute of Technology, Pittsburgh, announces a number of scholarships, fellowships and research assistantships in the division of personnel and psychology. The scholarships carry remission of tuition, the fellowships a stipend of $300 to $600, and the assistantships a renumeration of $1200 to $2000. Many opportunities for employment as research specialists, field agents, statisticians, personnel directors, educational directors, and supervisors of personnel research with salaries ranging as high as $4000 are announced by the Institute.

Dr. Bird T. Baldwin, director of the Iowa Child Welfare Research Station, announces research assistantships in child psychology and in the nutrition of the child paying from $400 to $1500.

Mr. S. D. Porteus, formerly of Melbourne, Australia, well known for his maze tests of intelligence, has been made director of the research department at the Vineland Training School for the Feeble-Minded.

Professor Guy Montrose Whipple, professor of applied psychology and director of educational research at the Carnegie Institute of Technology, has accepted a position as professor of experimental education and director of the bureau of mental and educational tests at the University of Michigan.

Dr. Clinton P. McCord, health director for the board of education, Albany, N. Y., instructor in educational hygiene in the Albany Medical College, and consulting psychiatrist at the Berkshire Industrial Farm at Canaan, N. Y., has been giving courses in hygiene and physical diagnosis at the Cornell University Summer School of Physical Education.

Dr. Elsie Murray, professor of psychology and philosophy in Wilson College, Chambersburg, Penna., has accepted a similar position at Sweet Briar College, Virginia.

Professor Stephen S. Colvin, of Brown University, will lecture next year in the school of education of Boston University, giving four courses in the field of educational psychology. Edwin M. Chamberlin, Ph. D. (Harvard), has been appointed assistant professor of education.

PUBLICATIONS RECEIVED

FRED H. ALLEN. *Report on the Mentality of the Delinquent Boy According to the Binet-Simon Tests.* Twelfth Biennial Report of the Preston School of Industry, Ione, California, 1916. Pp. 22-31.

This group of 382 boys showed 19.4 per cent, of normal intelligence, 28 per cent. backward, 17.2 per cent. borderline cases, and 35.4 per cent. feeble-minded. The organization of the school endeavors to group the boys according to their mental level, and thus to give each one such training as he can profit by.

FRANK W. BALLOU. *A Plan for the Promotion of Teachers from Merit Lists.* Bulletin No. xiv, of the Department of Educational Investigation and Measurement, Boston, Mass., 1918. Pp. 63.

After a survey of the qualities of merit in teaching presented by Ruediger and Strayer, Boyce, and others, a scheme for the rating of teachers in Boston was devised, and its application to local conditions described in detail. The paper will be of value to those who are wrestling with the problem of the rating of teachers.

FRANK W. BALLOU. *Organization and Administration of Intermediate Schools in Boston.* Bulletin No. xvii, of the Department of Educational Investigation and Measurement, Boston, Mass., 1918. Pp. 75.

Section I of this bulletin is devoted to a general discussion of the intermediate or junior high school, section II traces the development of intermediate schools in Boston, section III considers both the elementary and secondary schools of Boston with reference to the need for intermediate schools, and section IV presents a plan for the organization and administration of intermediate schools. While the principle of special advancement classes and of adjustment of the work to the individual pupil is formally approved, the detailed time schedule for the VII and VIII grades does not give great promise for the effectual realization of this ideal.

HARRIET M. BARTHELMESS. *Determining the Achievement of Pupils in Letter Writing.* Bulletin No. xvi, of the Department of Educational Investigation and Measurement, Boston, Mass., 1918. Pp. 35.

This bulletin presents the results of a test in letter writing given to VI, VII and VIII grade pupils in ten elementary school districts of the City of Boston. Letters were received from 3,603 pupils, and showed a median number of errors per letter of 7.1 for the VI grade, 6.4 for the VII grade, and 5.9 for the VIII grade. A detailed analysis is made of these errors with reference to the heading, the body of the letter, and the address. The illustrative samples of errors in grammar, phraseology and sentence sense afford interesting evidence of the difficulty that teachers have in developing good English habits.

G. VERNON BENNETT. *The Junior High School.* Baltimore: Warwick and York, 1919. Pp. xi, 224. $1.25.

This timely book presents in simple, compact form what many school men want to know about the junior high school movement. The author disclaims encyclopedic inclusiveness at the start, and relies largely upon his own experience and observation. A discussion of the problems presented in the transition from elementary to secondary education is followed by a history of the junior high school

movement. Various objections that have been offered to the junior high school plan are taken up and answered one by one, and its reflex effect upon the work of the first six grades receives careful attention. Several proposed courses of study are examined with reference to the emphasis placed upon the different subjects, much space is devoted to the character of the teaching force, the methods of teaching, and the administration of the work, and the relation between the junior and the senior high school is carefully considered. A final chapter sums up the author's views under the caption of an ideal junior high school. An appendix contains typical junior high school courses of study, and there is a bibliography of thirteen pages, arranged in the rather awkward fashion of grouping the articles according to the publications in which they appeared.

CLARA BEVERLY AND S. A. COURTIS. *English Composition, for use in the Detroit Public Schools.* Detroit: Board of Education, 1917. Pp. 158.

The purpose of this monograph is to help teachers to use a composition scale by presenting a large number of samples from grades III to VIII evaluated on the basis of the Hillegas Scale. There are pertinent suggestions to teachers on the use of a composition scale, five sets of ten compositions each representative of the work of the Detroit elementary schools, thirty-five specimens from the low sixth grade evaluated by four trained judges, a rating of teachers' marks on the basis of the Hillegas scale, set J from the Thorndike collection of compositions, and three or four other sets of samples. The abundance of material offered will assist teachers who complain that the range of samples in the Hillegas scale is too restricted.

J. A. BEXELL. *First Lessons in Business.* Philadelphia: J. B. Lippincott, 1919. Pp. 174. Sixty-eight cents.

Pupils of the eighth and ninth grades will find this little book of distinct value to them in mastering the factors of personality that make for success in business, and in becoming familiar with business forms. Among the topics discussed are honesty, courtesy, industry, personality, initiative, loyalty, dependability, thrift, bookkeeping, household accounts, business terms and forms, the business office, filing documents, and organization and management of savings banks.

JEAN BROADHURST AND CLARA L. RHODES. *Verse for Patriots, to Encourage Good Citizenship.* Philadelphia: J. B. Lippincott, 1919. Pp. xi, 367.

This splendid volume of poetry offers an ideal aid to the teaching of patriotism in the schools. From the verse produced during the war have been drawn some of the finest examples,—"The Road to France," Daniel M. Henderson; "Salutation, Marion Couthouy Smith; "In Flanders," John McCrae; "Verdun," Berton Braley; "The Soldier," Rupert Brooke; "I have a Rendezvous with Death," Alan Seeger; and many more.

CHESTER LEE CARLISLE. *The Causes of Dependency, Based on a Survey of Oneida County, New York.* New York State Board of Charities, Bureau of Analysis and Investigation, Eugenics and Social Welfare Bulletin No. xv, 1918. Pp. 465.

In this excellent study we find a history of the county, a description of the people, an account of industrial development, an examination of children in the public schools, and a survey of the public institutions of the county from the point of view of dependency. The author presents evidence to show that the causes of dependency are chiefly hereditary. The report presents an abundance of case studies.